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LORD HORDER

IT was with sadness and a feeling of real loss that we in Physical Medicine learnt of the death of Lord Horder; for as President of the Association he had long guided our affairs, and many of us, irrespective of age or seniority, had come to regard as a friend "this small dark man", as *The Times* described him, "with his dark moustache and his twinkling, quizzical eyes".

The achievements of this remarkable man, his service to medicine and the community, his fearless opposition to anything which he considered to encroach on the freedom of the profession, have been amply recorded elsewhere. Our brief here is to recount his services to Physical Medicine, which indeed were many. He had been President of the British Association of Physical Medicine since it was formed in 1943. He presided over the highly successful International Congress in London in 1952. He had been President of the International Federation of Physical Medicine since 1952. From 1926 to 1928 and again from 1942 to 1950 he was President of the Chartered Society of Physiotherapy and subsequently Emeritus President. In these offices he was by no means only a figurehead. He was always ready to give advice, and indeed he would get vexed if he were not kept fully in the picture. No one who was present at the Annual General Meeting of the Association in April this year will forget what a splendid chairman he could be. On that occasion he showed his capacity for getting people to speak out—and speak up—and yet at the same time by using his ready wit he kept speakers to the point and stopped them going too far.

It is not in the least surprising that Lord Horder took an active interest in Physical Medicine. Indeed, with his broad and humanistic approach it seems inevitable that he should be attracted to a branch of medicine

which represented, as he said in his Opening Address at the International Congress, "one of the most important applications of Science and Art to the philosophy of healing". The same address to the delegates contains the following sentences: "Your work has not only resulted in the saving of many lives; you have done a more difficult job than that. You have made folk's lives healthier and happier, and that is a much greater service to humanity than merely saving lives."

It was the extreme good fortune of the British Association of Physical Medicine to have Lord Horder as its first President. Its formation occurred during the most important period in the modern history of our subject. The success of the physical development centres in the Army, the advances in electrodiagnosis, the great developments in rehabilitation had enlarged the scope of Physical Medicine to a degree which could not have been envisaged five years before. Furthermore Physical Medicine was now a clinical as well as a therapeutic subject, and active, purposeful therapy rather than passive palliation was the guiding principle. It could almost be said that Physical Medicine was a new specialty. In these circumstances the new Association required as its President a leader, and a leader with many qualifications. He must be well known and respected in the profession; he must have a genuine interest in the subject; he must be prepared to put in much work and to give of his best to help this new body over its teething troubles and develop along the right lines. Lord Horder had all these qualifications and his personality was quite unique.

The Association will ever be grateful to him for his leadership, and also for his faith in the specialty. To quote him once more: "It has been said that young men see visions and old men dream dreams. Well, call it a vision or call it a dream, I see this branch of medicine both in its extent and in its depth increasing in significance as the years go by." May we justify his faith in us.

The following tributes have been received from Dr. Frank Krusen (U.S.A.), first President of the International Federation of Physical Medicine, and Dr. Svend Clemmesen (Copenhagen), President of the forthcoming congress at Copenhagen.

Dr. KRUSEN writes: The many American friends of Lord Horder who respected and admired him for his multitudinous contributions to medicine join with their colleagues in Great Britain in mourning his loss. We console ourselves with the knowledge that his final illness was a short one and that his life was long and fruitful. It was my privilege to know

Lord Horder and to have been granted by him the privilege of joining that wide circle of admiring friends who were permitted to call him with deep affection "Tommy". One could not fail to be impressed with the sincere admiration displayed by the many physicians spoken of collectively by him as "my young friends". I was deeply honoured to have been included in this group.

During his later years Physical Medicine was one of his major interests, and his foresight led him to appreciate the important contributions which were being made in this field and to lend his vigorous support and enormous prestige to the advancement of our specialty. In doing so he placed every physician interested in the advancement of Physical Medicine deeply in his debt. Although I had known him previously, I do not think that I got to know Lord Horder well until I officiated with him at various ceremonies connected with the International Congress of Physical Medicine in London in 1952. It was then that I learned to appreciate his scintillating mind, his tireless energy, his broad humanitarianism, and his inspiring exhibition of the qualities of true leadership.

These associations have led me to write of him as follows, but even as I do so I can envision him deprecating such praise as only the beloved "Tommy" would. His broad interests and his humanitarianism led him to support and encourage many societies designed to maintain the welfare of the individual. He travelled widely, wrote much, and lectured in most parts of the world. He was a man who appreciated the vast contributions of science as only a true scientist could.

It was Lord Horder who said: "The average individual recognizes that at the present time both politics and economics—and some would add even religion—regarded as systems of human betterment, seem to have failed him and science alone is not bankrupt." He was a writer who appreciated good literature, as only a good author could. He was the person who said: "Propagandism is the servant of expediency; literature is for all time." He was a patrician who appreciated the importance of quality, and who as a teacher did much to improve the quality of medical practice among his students. He was the savant who said: "As a disciple of Francis Galton, I am much more interested in the quality than in the quantity of our people."

During his lifetime he directed his facile mind toward the consideration of an amazingly wide range of important new phases of medical practice and national health in war and in peace. In more recent years, with the ending of World War II, he had evinced a broad interest in the social aspects of medicine. Not the least of his contributions was his support of our field of physical medicine, and the mere fact that he did interest himelf in our field benefited the specialty enormously. It was said of him that he was "kind and wise to a degree not so often met with nowa-

days" and that he was "one of the finest examples of the true physician". The world has sustained a great loss in the passing of our beloved "Tommy".

DR. CLEMMESEN writes: An oak has fallen to the ground. Lord Horder is dead. Much of the work he supported will grow.

I went out this evening for a walk along a small lake at sunset to recall him. Once again I heard his cheerful voice: "The given core should be kept." "The unity of Physical Medicine should not be split up into minor specialties." "Sectarianism and separatism should be avoided." I remembered him at his ease "in the chair" before the crackling coal fire discussing the future of Physical Medicine. Always the future, not the past.

Nobody who attended the Ostend meeting will ever forget his speech about pain. He gave us fire and light for the coming congresses through his Ceremonial Lamp. What a gift! "If you can talk with crowds and keep your virtue, or walk with kings, nor lose the common touch!" An oak. A man.

LORD HORDER ON PHYSICAL MEDICINE AND REHABILITATION

The following paragraphs are reprinted from Lord Horder's book, "Fifty Years of Medicine", by kind permission of the publishers, Messrs. Gerald Duckworth & Co., Ltd.

As one of the most important developments in Medicine in my time, and especially during the last two decades, I now take up the story of *Physical Medicine*. Its growth from small beginnings to its present stature has been very striking. No one who takes a pragmatist's view of the healing art doubts the validity of Physical Medicine as a special branch embracing both diagnostic and therapeutic aspects.

The sun, the air, water, exercises, and manipulation have been Medicine's handmaidens since earliest times. Each one of these has been vaunted as the panacea for man's ills—or their prevention—and this faith, originally primitive, still exists under the guise of various systems of "therapy". Fifty years ago or so, the large teaching hospitals in this country—institutions which have mirrored the progress of Medicine with remarkable clarity—began to set up special departments in which physical methods in diagnosis and treatment were employed. It is noteworthy that diagnosis was as early a feature as treatment in the beginnings of Physical Medicine, because there are critics who express doubt as to whether the field of Physical Medicine covers anything more than treatment. In the early "electrical departments", for example, the discoveries of Erb and Duchenne were followed and developed, and invaluable help in differential diagnosis resulted. One of the pioneers in this country was Lewis Jones, my own colleague and special friend at "Barts." As the various forms of "ray therapy" were introduced these were grafted upon the electricity service. Similarly, departments were set up for massage and gymnastics, generally under the charge of the orthopaedic surgeon. At first these departments were stowed away in attics and odd corners and, more often than not, it was the flotsam and jetsam of his medical and surgical colleagues with which the chief of the department had to deal. Water, as a therapeutic agent, was in the hands of the "balneologist" at the spas: air and sunlight were restricted to treatment of the tuberculous patient—far too restricted, as we now realize. X-rays, both for diagnosis and treatment, grew so rapidly in demand that they soon became a specialty in themselves.

It was by a fusion of these early departments some two decades ago that the first integration took place leading to the special hospital service which we now know as Physical Medicine. Later, there arose a relatively new element—the whole nexus of diagnostic and therapeutic measures,

both preventive and curative, resulting from experience gained in "physical training" during the war. So short was manpower, manpower that was fit, in the early stages of conflict, that those responsible for the fighting personnel decided to give serious attention to the large number of unfit men who had been recruited. They sought the help of key medical men in an effort to upgrade a large proportion of these unfit recruits, a step which was rewarded to a quite surprising degree. The experience thus gained was much too valuable to end with the war; it was carried over into the peace and soon became a fundamental feature in the new concept of Physical Medicine. With this development the name of my friend Brigadier Howitt will always be closely associated.

Concurrently with this development on the physical training side another advance was taking place—the Chartered Society of Physiotherapy was rapidly becoming a corps of highly trained men and women, available for skilled service in the Physical Medicine field.

The union of these two tributaries, as it were—a congeries of technological procedures on the one hand and the application of the lessons learnt from physical training on the other—resulted in the river which came to be called Physical Medicine. The union was not easily effected. Individual claims asserted themselves; there was a tendency for the followers of one cult to disparage the work of the other: there was talk of the "gadget monger" and of the "sergeant major". But common sense and a common purpose—the patient, actual or potential—made the necessary adjustments, and the formation of the Section of Physical Medicine at the Royal Society of Medicine in 1931 and, still more fundamental, the founding of the British Association of Physical Medicine in 1943, went far to effect the desired equilibrium. Both groups settled to a loyal pooling of their contributions and the stream became strong and therefore effective.

The scope embraced today by the combined efforts of the two groups I have outlined is very wide. It stretches from the fundamental efforts to secure proper poise and posture and stance and gait and breathing at one extreme to the correction of deformities, help for the paralytic, and the management of convalescence, whether from illness or injury, at the other.

It fell to my lot to act as integrator in this amalgamation, for I was the first President of the British Association of Physical Medicine and I also presided at the Chartered Society of Physiotherapists. But I was also Chairman of the Empire Rheumatism Council, and Physical Medicine takes a major part in the management of the rheumatic patient. To suggest that there is room for any conflict between those whose main interest in the rheumatic diseases lies in their causation and natural history and those who approach the same problem from the therapeutic angle of Physical Medicine indicates lack of clear thinking. The difficulty is only imaginary. The two spheres overlap, and closely, as evidenced by

the fact that the personnel of the Empire Rheumatism Council, founded in 1934, and the British Association of Physical Medicine has many names in common.

It is to be conceded that the demands made upon the physical medicine specialist are great. That he must be a clinician first and foremost follows clearly from the principles to which I have already referred. In his approach to, and handling of, his patient he must have the whole man in mind and not merely the part of him for which his help is particularly required. He must win his patient's confidence early and must keep it throughout, for he will be more dependent upon his patient's co-operation in the carrying out of treatment, which will often be tedious and not infrequently discouraging in the patient's eyes, than is the case in most of the other branches of Medicine. Indeed, there is no branch in which success turns so much upon the power of the physician to infuse the patient with his own personality.

But that there are men who combine these essentials in their make-up and in their training becomes more and more obvious as the growth of the specialty proceeds. And since it is inevitable that their own intrinsic interest, regarded technologically, will be greater in one direction than in another in this composite field, these men will, when chiefs of departments of Physical Medicine, choose their own particular one, so that the team may be as representative as possible of the whole diagnostic and therapeutic problems presented to it.

That such men should possess what is termed a "higher degree", both to signalize their status and to give them the necessary prestige, goes without saying. That they should rank on an equality with the physicians and surgeons attached to the staff of the hospitals they serve; that they should teach; and that they should, whenever practicable, have both out- and in-patients under their special care, is equally self-evident. Only in this way does the Physical Medicine Department of a hospital live up to the acknowledged importance of the subject.

Linked with Physical Medicine and developing with it, there has been a new orientation to which the name "rehabilitation" has been given. I say linked with Physical Medicine because the chief approach to this remedial discipline has been through physical means. The other great means of approach is the psychological. To keep these two means closely in mind is essential. The idea of rehabilitation is, of course, not new. It has always been inherent in the tradition of Medicine that the doctor's work does not cease with the mere cure of his patient's disease or the correction of his disability, but only when he has done his utmost to enable the patient to function again as an active member of the community. This is, of course, the purpose of Medicine in general and applies equally to disease as to injury, to dysfunction of the heart or kidney or lung as to paralysis or deformity of the limbs.

All the same, a new significance *does* attach to the concept of rehabilitation as the result of a more hopeful and more helpful spirit shown by modern Medicine towards those who have been handicapped by disease or injury, this spirit being backed by new techniques, new instruments, and new efforts, begun earlier and persisted in longer. It is in the exploitation of this new spirit and of those new methods that Physical Medicine plays such a large part.

Moreover, those who speak of rehabilitation as a new thing overlook the work done in the war 1914-18. The general plan of rehabilitation today is founded on the experience of the special military hospitals organized during those war years, in which all the ancillary departments that exist in the best-equipped hospitals of today were represented, not excluding "curative workshops" and the provision of psychiatric help.

As for the word "rehabilitation", the objections that have been raised to it seem somewhat pedantic. Used in the legal sense the word is both old and definite and its transference to Medicine is quite justified. The only alternative word is "reconditioning", but "rehabilitation" has got a good start and, since it is now on the statute-book, we may assume that it has come to stay.

What is new, however, is the realization of the importance of concentrating upon the later stages of the patient's treatment when the disability has been sudden and severe, so that the convalescent stage is not spent in physical and mental inactivity; and of detecting states of "subhealth" which, by appropriate measures, may be tackled before these conditions are allowed to drift into actual disease. These are essentially the two fields in which the various therapeutic techniques which are included in the practice of rehabilitation operate. Two principles should guide those concerned. The first of these is that the earlier and the more systematized the exploitation of active rather than passive measures, the better the result both in the field of the locomotor system and in the psychological field.

In this connection I may perhaps be pardoned a quotation from my Founder Lecture before the Chartered Society of Physiotherapists nearly 20 years ago: "No amount of massage and passive movement has the same value in the restoration of function as active movements carried out under skilled supervision." The teachings of Hilton Young and Weir Mitchell in regard to rest were pertinent and necessary in their day, and have their lessons for us also, but the empirical gambles of the bonesetter and other quacks, and the frequency with which these charlatans "got away with it", showed us how woefully these doctrines could be abused. The work of Hugh Griffiths and others has revealed how far a truly scientific approach to the study of restoration of function can take us.

The second principle is the importance of community in the treatment of every patient. The series of stages—rest, remedial exercises, diversional therapy, occupational therapy, vocational training (and resettlement)—should show a progressive scheme with a definite policy applicable to each case and explained fully to the patient.

Doctor, physiotherapist, nurse, instructor, almoner—all should be intelligently alert, bent upon arousing and keeping the patient's interest, not only in his present state (still less in his past) but also in his future.

Government action has aided all this in powerful fashion. In accordance with the altogether excellent recommendations of the Tomlinson Committee, the Disabled Persons (Employment) Act of 1944, and the power given to the Minister to establish rehabilitation centres, have reinforced the principles which I have just defined.

I said just now that rehabilitation in the psychological field should keep pace with rehabilitation in the physical field. This is essential for the reconditioning of the whole man. Indeed, in many cases the psychological field is the more pertinent. A typical British effort, and, it is generally conceded, a very successful one, has been carried out recently in this direction at Roffey Park, near Horsham. Here Dr. Thomas Ling has been doing notable work under a Council of which I have had the privilege of being chairman.

Sponsored by some fifty well-known industrialists, over a hundred patients have been in residence here for an average period of six weeks during the last five years. The cases have been carefully selected. They have been those of that indeterminate nature so frequently labelled "nervous debility". Under Ling's able guidance a highly qualified staff has analysed the factors (not necessarily the patient!)—industrial, domestic, and temperamental—entering into the causation of these people's vague ill-health, resulting in absenteeism and inefficiency. The fact that over 80 per cent of the patients at Roffey Park have been returned to work in a state of physical and mental health is ample demonstration of the value of this particular effort.

With the arrival of the National Health Service, and despite all our efforts to get this institution exempted, this model of effective medical science was denied its autonomy. It actually "went begging", and eventually has become an annexe of a London teaching hospital, so losing its individuality and, to a large extent, its influence.

THE VALUE OF PHYSIOTHERAPY IN RHEUMATIC DISEASES

I—PALLIATION

By J. S. LAWRENCE and R. J. SLADDEN
From the Walkden Clinic, Manchester

In assessing the value of a method of treatment for rheumatic disease the problem may be approached from two different angles: (1) whether the remedy relieves the pain, and (2) whether it hastens recovery or renders it more complete. The present paper deals only with the first, or palliative, aspect; the effect on recovery will be considered in a later communication.

Difficulties in Assessment

Individual Bias.—When investigating the palliative action of a remedy certain fallacies must be guarded against. The analysis of results must of course depend on the patient's statement, and this may be considerably affected by his attitude to the treatment. It is therefore desirable to compare the effect of several different treatments on the same individual rather than to give one treatment to each patient as is done when assessing recovery times. In this way individual bias is reduced to a minimum.

Pain Intensity.—Another difficulty arises from the varying severity of pain. As patients usually first attend for treatment at the height of the attack, it follows that the pain is generally greatest at the first attendance and becomes less as the attack subsides. Consequently the first remedy to be used, other things being equal, will appear the least effective, since the pain is then relieved only with difficulty. It is thus essential so to arrange the experiment that the initial treatments are either randomly distributed or allocated in strict rotation. The simplest plan is to use a strict rota. Subsequent treatments must also be so arranged that in each group they are evenly distributed throughout the course of the attack. In the sample rota given in Table I, the first patient started with short-wave diathermy, then went on to radiant heat, followed by infra-red, ultrasound, ultra-violet light, and wax. The next patient would then start with radiant heat, followed by infra-red, and so on. In this way each therapeutic agent has an even chance of being applied at the beginning, middle, or end of treatment.

Placebo Reactors.—A further difficulty in this type of trial is the problem of the placebo reactor (Beecher *et al.*, 1953). Placebo reactors are those patients who are ready to admit that they have been greatly relieved no matter what the treatment. These patients, though in the ordinary way gratifying to treat, can be a source of great difficulty in a therapeutic trial

TABLE I

PROFORMA FOR PALLIATION TRIAL

Patient's Name	Short-wave Diathermy	Radiant Heat	Infra-red Rays	Ultra-sound	U.V.L.	Saline Ionization	Wax
A. Smith ..	1	2	3	4	5	6	7
B. Jones ..	7	1	2	3	4	5	6
C. Brown ..	6	7	1	2	3	4	5
J. Johnson ..	5	6	7	1	2	3	4
P. Kirkpatrick	4	5	6	7	1	2	3
F. Hulme ..	3	4	5	6	7	1	2
J. James ..	2	3	4	5	6	7	1

of this sort. By exaggerating the effect of the less potent remedies they tend to make all methods appear equally effective. To keep a check on this type of patient it is thus important to include in the trial a placebo or mock treatment. In the present study the rays from a mercury-vapour lamp filtered through glass or mica were used for this purpose.

Method

The treatments investigated are shown in Figs. 1 and 2 and include most forms of heat and electricity in present-day use, with massage as a subsidiary treatment. Dosages were those customarily employed in routine treatments, as follows:

Short-wave diathermy: Maximum tolerance for 20 to 30 minutes—inductotherm or disk electrodes.

Ionization:
Saline, Salicylate, Iodide } 4 mA per sq. in. for 20 minutes.
Histamine: 5 mA for 5 minutes progressing to 10 mA for 10 minutes.

Radiant heat: 1,000 watts for 30 minutes at minimum tolerated distance of about 2 ft. 6 in.

Infra-red rays: 450 watts for 30 minutes at minimum tolerated distance of about 2 ft.

Infra-red + ultraviolet rays: 30 minutes + 1 minute upwards by ½ minute (14 in. distance, 3rd-degree erythema).

Ultraviolet rays (14 in.): 2 minutes upwards by ½ minute, 3rd-degree erythema.

Traxator: 15 minutes.

Ultrasound: 5 minutes—moving applicator, just below maximum tolerated intensity.

Wax baths: 114° F. for 20 minutes
Wax packs: Starting at 114° F. for 20 minutes } as applicable.

Movements, whether active or passive, and immobilization were not included, as it was felt that their action was not primarily palliative. The last form of treatment shown in Fig. 1, the traxator, is a device which we were asked to test. It is designed to give suction by means of a cup applied to the skin, rather after the fashion of dry cupping.

In this study, which was carried out on out-patients suffering from a variety of chronic rheumatic disorders, the same treatment was given on

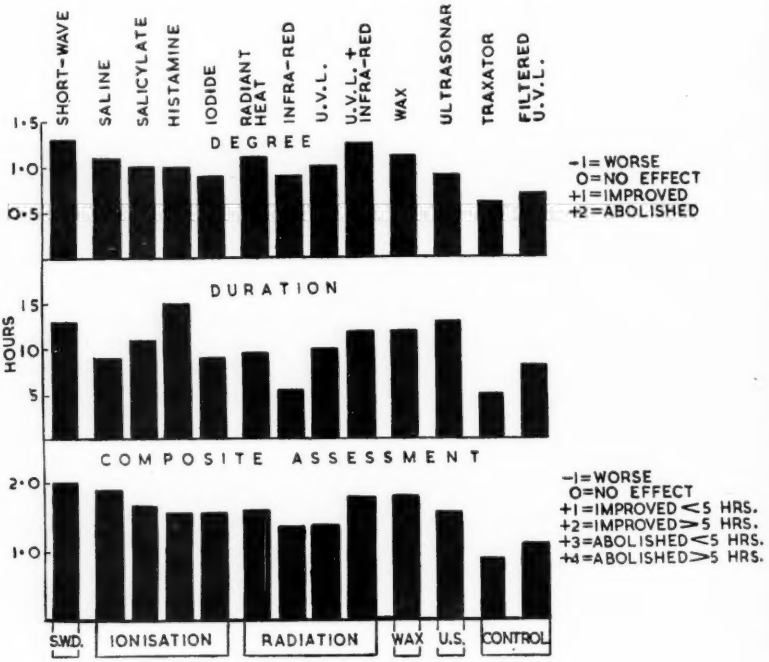

FIG. 1

TABLE II

RELIEF OF PAIN FROM PHYSIOTHERAPEUTIC AGENTS IN CHRONIC RHEUMATIC DISEASE

Effect on Pain	Duration (hours)	Short-wave Diathermy	Ionization				Radiant Heat	Infra-red Rays	Ultraviolet Rays	Infra-red + U.V.R.	Wax	Ultrasound	Traxator	Filtered U.V.R.
			Saline	Salicylate	Histamine	Iodide								
Aggravation		0	1	4	2	3	1	0	0	0	2	1	9	1
No relief ..		4	8	6	7	5	7	6	10	3	4	3	7	15
Partial relief	Less than 5 hrs.	16	10	13	17	10	13	18	17	12	16	9	16	7
	More than 5 hrs.	15	11	15	16	14	15	13	8	14	28	6	8	13
Complete relief	Less than 5 hrs.	6	7	5	3	3	4	1	1	3	10	0	1	3
	More than 5 hrs.	10	10	5	5	6	6	3	5	5	4	4	4	1

three consecutive occasions over a period of a week. The patient was then asked whether the pain was relieved by the treatment, whether the relief was partial or complete, and how long it lasted. Where he seemed uncertain of the duration of relief he was asked whether it was more or less than five hours, and this has been used as a cutting-point in the subsequent assessment of the results.

Results

The *degree of relief* was assessed on a points system, as indicated in Fig. 1, and is expressed as an average of the results in some 40 patients (see Table II). Assessed in this way, short-wave diathermy gives the greatest degree of relief, combined infra-red and ultraviolet radiation would appear slightly less effective, and radiant heat, saline ionization, and wax baths come third. The remaining ionizations, infra-red rays, ultraviolet light, and ultrasound are the least effective of the standard methods of treatment, but all give a greater degree of relief than the traxator or the placebo.

The *duration of relief*, on the other hand, is greatest from histamine ionization, with an average relief of 15 hours. Next come short-wave diathermy and ultrasound, with relief for 13 hours. Rather shorter relief was experienced from wax, the other forms of ionization, and the radiations; the shortest relief was from infra-red radiation, the traxator, and the placebo.

In the *composite assessment* the degree and duration of relief are combined in a single figure obtained by giving a different points rating to those relieved for less or more than five hours and to those with partial and complete relief. On this rating most forms of treatment give roughly twice as much relief as either the placebo or the traxator, which have therefore been classed together and labelled as controls. Of the treatments used, short-wave diathermy has given most relief, saline ionization next, then wax baths and combined infra-red rays and ultraviolet light. Less effective were ultrasound and the remaining forms of ionization and radiation. Statistically, all standard treatments were more effective than the controls, and the most effective (short-wave diathermy and saline ionization) more effective than the least (infra-red rays alone or ultraviolet light).

Massage

As massage is generally prescribed in combination with other physiotherapeutic methods it has been so used in this trial, the patient regularly being given some form of heat treatment while the massage was varied according to a rota. Three periods of treatment were studied: with no massage, with dry massage, and with massage using a cream. In this way

it was possible not only to evaluate the massage, but also to obtain some indication of the relative importance of skin friction and deep pressure in producing whatever effect might be observed. The massage used in this study was deep massage, and was not designed specifically to stimulate the skin.

The control group has been included in Fig. 2 and indicates the com-

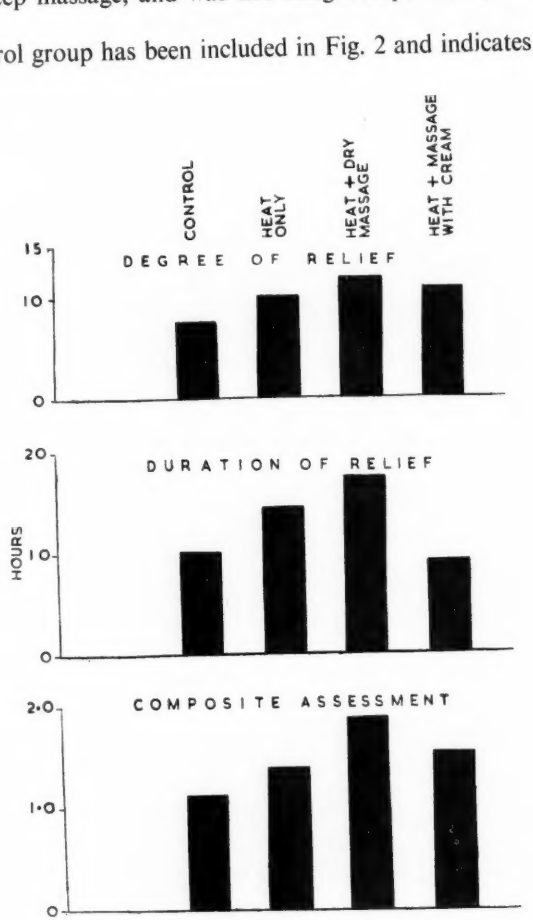

FIG. 2

parison between heat alone and a placebo, and the still greater degree and duration of relief when dry massage was added. When, however, a cream lubricant was used during massage the degree, and particularly the duration, of relief were reduced, and indeed it would appear from the composite assessment that the palliative effect of the massage had been completely nullified.

Correlation of Relief of Pain with Skin Temperature and Radioactive Sodium Clearance

Mode of Action.—Deep pain, which is the type mainly encountered in the rheumatic diseases, might theoretically be relieved in three different ways. The deep pain threshold might be raised either by increasing the temperature of the hyperalgesic deep tissues or by producing skin pain (Kellgren *et al.*, 1948; Macarthur and Alstead, 1953). Alternatively, a physiotherapeutic agent might act by increasing the circulation in the damaged tissues and so hastening the absorption or metabolism of a pain-producing metabolite.

Deep-tissue temperatures can readily be measured by means of a needle thermocouple (Whyte and Reader, 1951, 1952), and this may also be used to measure changes in skin temperature which, provided the environmental temperature is kept constant, reflect the degree of skin stimulation. The deep circulation may be assessed by the radioactive isotope clearance test of Kety (1949). This method has been extensively used for the investigation of physiotherapeutic procedures by Harris and his colleagues (1955), to whom we are indebted for the data included in Table III.

TABLE III

CORRELATION OF RELIEF OF PAIN WITH TISSUE TEMPERATURES AND RADIOACTIVE SODIUM CLEARANCE

	Degree of Relief	Duration of Relief (hrs.)	Composite Assessment of Relief	Temperature Rise (°C.)				Sodium Clearance at Depth of 20 mm.
				Surface	At Depth of			
					2 mm.	10 mm.	20 mm.	
Short-wave diathermy	1·3	13	2·0	4·2°	6·4°	5·0°	5·4°	+38%
Saline ionization	1·1	9	1·9	9·0°	7·4°	3·7°	1·9°	−18%
Salicylate ionization	1·0	11	1·7	5·9°	5·5°	2·6°	0·7°	
Histamine ionization	1·0	15	1·6	3·4°	1·6°	−1·0°	−2·7°	−15%
Infra-red rays	0·9	6	1·4	4·6°	4·0°	3·6°	1·3°	
Massage	1·1	13	1·6	3·9°	0·8°	−2·1°	−1·0°	0

It was felt that a useful purpose might be served by comparing the relief of pain as already assessed with the results of these physiological tests. Apart from the sodium clearances, the tests were carried out with the same dosage and duration in respect of each type of treatment as when assessing the relief of pain.

With short-wave diathermy (Table III) there is the customary fairly uniform heating at all depths, rather greater at 2 mm.—that is, in the subcutaneous fat.

Saline ionization caused a very considerable increase of skin temperature, the effect diminishing till at a depth of 20 mm. it was only some 2° C. The deep sodium clearance was actually reduced. As, however, for the purpose of this last test a lower current was used, the effect on deep circulation may not have been identical with that encountered during treatment. Salicylate ionization had the same effect on tissue temperatures as saline ionization, but less marked. With histamine ionization there was an increase of skin and subcutaneous temperatures, but a reduction of the deeper temperatures and also of the deep sodium clearance.

Infra-red irradiation gave a moderate increase of skin temperature with some degree of heating of the deeper tissues down to 10 mm. and very little at 20 mm.; and massage, a moderate increase in skin temperature but a diminution in temperature in the deeper tissues.

Discussion

Of the three hypotheses mentioned earlier, no single one explains completely the relief which is afforded. If, for example, all methods of treatment relieved pain by skin stimulation, it would be expected that short-wave diathermy, since it produces most relief, would cause the greatest increase in skin temperature, whereas it is far exceeded in this respect by saline ionization. Similarly a rise in deep temperature cannot completely explain the relief of pain, since some methods of treatment actually cause a reduction in deep temperature—for example, histamine ionization and massage. Nor can an increase of deep circulation explain the relief of pain, since, whereas short-wave diathermy tends to increase the sodium clearance, ionization reduces it.

Thus it would appear that the methods of treatment outlined in this trial may act either by skin stimulation or by an increase of deep temperature, or sometimes by a combination of these two effects, both of which are known to act by raising the threshold to deep pain.

Several points remain to be answered. Is the relative value of these agents the same in all types of rheumatic disease? Are they equally valuable in local and referred pain? Do they relieve pain equally when applied to the site of the disease, or only when, as is customary, to the site of reference of the pain? These questions could be answered with certainty only by a much larger trial. Before this is undertaken it would seem important first to evaluate the effect of these and other physiotherapeutic measures on recovery. A remedy which relieves pain may indeed be undesirable if it delays or prevents recovery. Unfortunately, recovery trials take much longer to complete, particularly when the effect of

treatment is not dramatic, and the data on recovery which we have so far accumulated do not at present warrant publication.

The palliation trials we have described, however, indicate clear differences in the relief which physiotherapeutic methods can afford in rheumatic disease. Those in current use are all more effective than a placebo, and though the effect of the latter is such that suggestion must be assumed to play an important role—as indeed it does with all forms of therapy—it cannot account for the whole effect even of the least active methods. The physiological tests indicate that raising the pain threshold, either by skin stimulation or by a rise in deep-tissue temperature, will account for the remainder of the effect.

It is interesting to compare the degree of skin stimulation produced by these physiotherapeutic procedures with that obtained with rubefacient ointments by Symons (1955). The most effective of these, an ointment containing the butoxyethylic ester of nicotinic acid and nonylic acid vanillylamide, was found to raise the skin temperature by 4° C., whereas saline ionization in our experiments produced a rise of as much as 9° C.

Summary

A therapeutic trial to evaluate the palliative effect of physiotherapeutic procedures in the chronic rheumatic disorders is described.

Evaluation of eleven standard methods of applying heat and electricity showed that each was more effective than a placebo. Short-wave diathermy produced the greatest degree of relief, and histamine ionization had the most prolonged effect. Both the degree and duration of relief were augmented by massage.

As a result of comparing surface and deep-tissue temperatures with the degree of relief, it was concluded that massage and histamine ionization act by skin stimulation, and short-wave diathermy mainly by deep heating. Other forms of treatment appear to act by a combination of these two effects.

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THE ACTIVITY OF ANTAGONIST MUSCLES DURING VOLUNTARY MOVEMENT

By C. H. BARNETT and D. HARDING

From the Departments of Anatomy and of Physical Medicine, St. Thomas's Hospital Medical School, London

IT is generally believed that the activity of antagonist muscles during voluntary movement of a joint is governed by the principle of reciprocal innervation. Best and Taylor (1950), for example, state that "voluntary . . . contraction of a muscle, e.g. the biceps, is accompanied by the simultaneous relaxation of its antagonist—the triceps". It must be borne in mind, however, that this rule was originally deduced from experiments upon animals in which the tendons of the muscles being tested had been detached from their insertions (Sherrington, 1905), so that no stretching of the antagonist was produced when the prime mover contracted.

Antagonist muscles can behave in at least three distinct ways. When the external resistance is so great that, despite powerful contraction of the prime movers, the joint is not moved, the antagonist muscles can be shown, by electromyography or palpation, to relax. This effect constitutes reciprocal inhibition of antagonist muscles as commonly understood. When there is no external resistance to be overcome and the limb requires to be moved with deliberate precision, there is activity in prime movers and antagonists throughout the movement (Wilkie, 1950). This too is in accordance with the principle of reciprocal inhibition, since there appears to be an inverse relationship between the degree of activity in the two opposing groups (Fulton, 1926).

The present experiments were undertaken to determine the behaviour of antagonist muscles in man when the prime mover is acting against moderate resistance and the joint is being moved rapidly.

Method

The activity of the biceps brachii muscle was recorded by electromyography in nine normal adult subjects while the elbow was being actively extended at three different rates. The apparatus used is illustrated in Fig. 1.

Each subject was comfortably seated, with his right upper arm supported by an arm-rest and his wrist resting within a leather cuff suspended from the ceiling, the forearm being in the supinated position. Surface electrodes applied over the biceps muscle, a member of the antagonist muscle group, were led to an electromyograph and thence to one channel of a two-channel cathode-ray oscillograph. The wrist cuff was connected by a metal chain to one end of the lever arm of a rotating rheostat. This arm

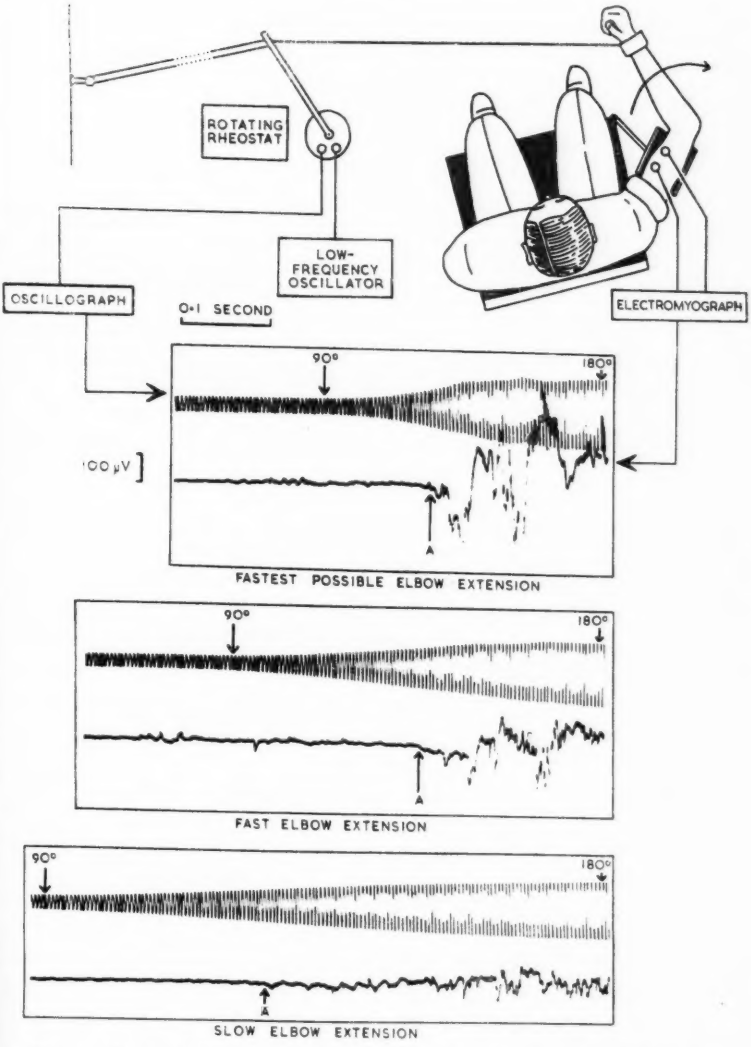

FIG. 1.—Composite figure showing the apparatus in use and three typical tracings.

was the same length as the subject's forearm and lay parallel to it; thus any change in the angle at the elbow was duplicated in the rheostat and produced a corresponding change in resistance. The rheostat was connected to the second channel of the cathode-ray oscillograph, a low-

frequency oscillator being incorporated in the circuit. The change in amplitude, and consequently the width of the band traced out, varied directly as the change in angle at the elbow.

Results

The oscillograph tracings were photographed and enlarged several times, and the widths of the band corresponding to the rheostat resistance when the elbow was at 90 degrees (initial angle) and 180 degrees (final angle) were measured. Since the increase in resistance per degree of increase in elbow angle was constant throughout the joint range, it was then possible to construct graphs relating the angle at the elbow to the time that had elapsed since the onset of extension. These were invariably S-shaped, deceleration of the forearm occurring when the angle at the elbow was nearing 140 to 150 degrees (Fig. 2).

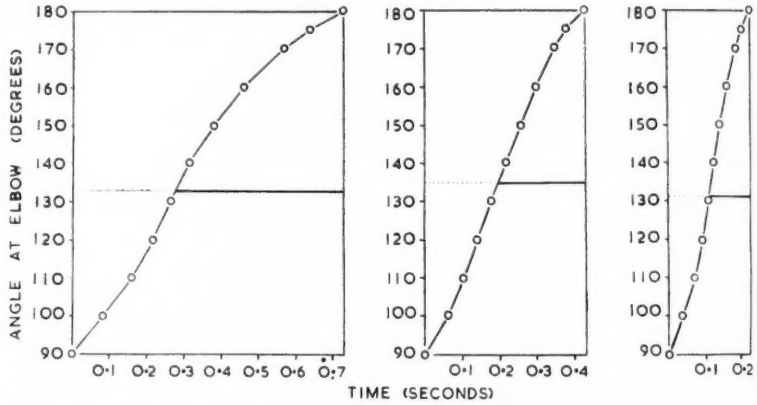

FIG. 2.—Extension of the elbow at three rates. The horizontal line indicates the antagonist muscle activity: ..... no activity recorded; ——— muscle active.

In nine of the records the biceps muscle was active throughout the movement of elbow extension; in the remaining sixteen records there was no detectable activity in the biceps at the start of extension, but when the elbow angle reached 130 to 140 degrees action potentials began and continued until the elbow was fully extended. The angle at which biceps activity was first consistently recorded always preceded the deceleration (and was presumably the cause of it), and was independent of the subject being tested and the rate of extension. As shown in the tracings in Fig. 1, however, the degree of contraction as judged by the level of electrical activity rose in proportion to the rate at which the elbow was being straightened.

Discussion

When the elbow is rapidly extended there is normally a short initial period during which no activity can be recorded in the biceps muscle, after which the muscle contracts and remains active throughout the rest of the movements. In some respects this finding accords with Hammond's (1954) observations: during rapid *passive* extension of the elbow contraction of the biceps was invariably noted, whether or not the external force was voluntarily resisted. This contraction was presumably the result of a stretch reflex as seen in experimental animals (Liddell and Sherrington, 1924). The present findings differ from those of Hammond, however, in that the latent period during *passive* movement is only 0·03 second, whereas the minimum period recorded during *active* movements was 0·08 second and was usually considerably more. It is possible that this difference depends upon the fact that the initial rate of stretch can be greater when the joint is moved passively than can ever be achieved by active exertion. On the other hand, the present findings may represent the resultant of two opposing effects—a central inhibition of the antagonist muscle and a reflex contraction due to stretching.

Voluntary contraction of prime movers is now realized to be a complicated process in which spinal reflexes play an essential part (Eldred, Granit, and Merton, 1953). The control of antagonist muscles is doubtless equally complex. One effect, probably incidental, of the predominance of the stretch reflex during rapid voluntary movement is that the velocity of the moving bone is reduced towards the extremes of the joint range (see Fig. 2). As a result of this deceleration, ligaments are less likely to be torn through accidental hyperextension at the joint.

Summary

When a muscle contracts isometrically or produces slow movement of a joint in the unloaded limb, activity in the antagonist muscles conforms to the principle of reciprocal inhibition of antagonist muscle groups. However, when the limb is actively moved at moderate or fast speeds against external resistance, the antagonist muscles, after a short period of inactivity, contract strongly. This contraction, probably due to a stretch reflex, decelerates the movement and reduces the risk of ligamentous strains.

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THE USE AND ABUSE OF PHYSIOTHERAPY

AT the meeting of the Physical Medicine Section of the Royal Society of Medicine held at the Society's House on December 8, 1954, the subject of discussion was "The Use and Abuse of Physiotherapy".

The meeting was opened by Dr. A. C. BOYLE, who, in welcoming the occasion of a frank discussion on the place of physiotherapy in medicine, emphasized that the use of this form of treatment as a placebo was rarely justified, not only because it was expensive, but also because the continued application of useless treatments could only bring discredit to the whole subject, including those techniques which had an important part to play in the management of the painful locomotor disorders. He realized, however, that there were difficulties in the critical evaluation of physiotherapy, which had as its chief aims the relief of pain and the restoration of locomotor function, in themselves difficult to assess; but the difficulties became even greater when physiotherapy was applied by elaborate apparatus to impressionable patients with conditions which were either self-limiting or else had a natural history of remissions and exacerbations. He chose to discuss physiotherapy in the treatment of three groups of diseases—namely, the rheumatic, chest, and neurological diseases.

In the *rheumatic diseases*, which were the particular concern of the specialist in physical medicine, the relief of pain by physiotherapy was usually short-lived, and Dr. Boyle therefore felt that unless the period of freedom from pain was exploited for the application of such active treatment as exercises it could be of little benefit. For wasted muscles active exercises were the natural method of treatment; but there was little doubt that they should be given as exercises against resistance as opposed to static muscle contractions or exercises against gravity, which were of doubtful value, except perhaps as a means of giving a patient confidence. However, he stressed that treatment of muscle wasting in the presence of active disease in neighbouring joints or of pain was doomed to failure unless these were first treated. It was more difficult to dogmatize the maintenance and restoration of joint movement, but it did seem that formal manipulation had a greater contribution to make than protracted physiotherapy, and certainly that attempts to prevent the onset of ankylosis in rheumatoid arthritis by the daily movement of affected joints were of little value; indeed they all too often led to ankylosis in a bad position. Dr. Boyle was particularly critical of the cult of group exercises, which appeared to have been dictated partly on economic grounds, partly by appreciation of their psychological value, and partly by over-enthusiasm for active rather than passive physiotherapy. He felt that exercises given under the individual care of physiotherapists were best, but that probably the most beneficial form of physiotherapy was

instruction in self-help given to a willing patient by a knowledgeable physiotherapist.

In *chest diseases*, Dr. Boyle was critical of breathing exercises both in the prophylaxis of the pulmonary complications of surgery and in the treatment of such conditions as asthma and emphysema. It had been shown that routine pre- and post-operative breathing exercises, in contrast to postural drainage, particularly if preceded by the inhalation of a bronchodilatory drug, failed to affect the incidence of post-operative pulmonary complications. Similarly in the treatment of emphysema and asthma the suggestion that breathing exercises could relax the thoracic muscles, prolong expiration, develop diaphragmatic movement, and inculcate the habit of controlled, even breathing had been disproved.

Under the heading of the *neurological disorders* Dr. Boyle discussed the place of physiotherapy in the treatment of both lower and upper motor neurone lesions. In lower motor neurone lesions he considered passive movements of the paralysed limb to be of definite value in preventing contractures, as was also intelligent splintage. Furthermore, electrical stimulation of the paralysed muscles to prevent atrophy and fibrosis where regeneration was anticipated was of proven value. There could, however, be no justification for electrical treatment of muscles where regeneration was not expected or where the lesion was a neuropraxia without actual degeneration. In upper motor neurone lesions passive movements appeared to be of equal importance in preventing joint stiffness, but it was doubtful if heat, massage, or relaxation exercises caused more than a temporary and short-lived decrease in muscle tone. It was much more important for the physiotherapist to encourage the return of active movements and to re-educate the patient in performing essential self-help. Finally, he considered that the treatment of disorders of co-ordination by Frankel exercises was rational and to be recommended.

Dr. G. BLAIR supported the opening speaker as regards the need for a critical evaluation of physiotherapy, not only because of its expense but also because of Britain's lead in this field over many other countries which must be maintained. He felt there was bound to be some abuse of physiotherapy just as there was of any other remedy. In the past physiotherapy had been linked with radiology, spa treatments, and orthopaedic surgery, and only comparatively recently had it found its proper place in the department of physical medicine. The fact that it was often carried out without direct medical supervision led to it sometimes being used as a placebo, and left the way open to extravagant claims being made for these procedures by those without adequate clinical experience. Because of its pleasurable and magical aspects it was inevitable that physiotherapy, essentially a technical procedure, should become overglamorized. Dr. Blair felt that to remedy this, all physiotherapists should

be supervised by, and their education be in the hands of, those who are primarily physicians and who in addition have knowledge and experience of the technical aspects of physiotherapy. It seemed that those with a special interest in the locomotor disorders—namely, specialists in physical medicine—were the most suitable for this responsibility. Furthermore, in order to remain in its proper relation to therapeutics physiotherapy should be prescribed by clinicians and not by practitioners of physiotherapeutic treatments, and more research into physiotherapy must be undertaken. Finally, Dr. Blair referred to the possibility of physiotherapy causing unsuspected harm, and compared the misuse of physiotherapy as a placebo with the misinterpretation of an innocent cardiac murmur which could have deleterious results for the patient.

Squadron Leader WYNN PARRY considered there were four things which particularly tended to the abuse of physiotherapy: (1) too many patients being treated in a department; (2) the use of poor techniques leading to ineffective treatment; (3) delay in referring patients for physiotherapy when it was clearly indicated; and (4) inadequate training of physiotherapists. It seemed to him that much unnecessary treatment could be avoided by discarding procedures of doubtful value, such as ionization, ultrasonics, and microwave diathermy, which had not proved their worth. These should be replaced by forms of treatment with clearly defined indications used accurately. Thus short-wave diathermy was indicated only where deep heat was required to help resolve pathological processes. Similarly, the only indication for faradism was where voluntary muscular contraction was not strong enough to make exercises worth while; and for interrupted galvanism to denervated muscles, when there was every reason to anticipate nerve recovery before the onset of fibrosis. Massage had its specific indications in the treatment of adherent scars, fibrosis, and oedema of the lower limbs, but was of little value as a generalized treatment for the relief of spasm and pain. All this was not, the speaker felt, as important as the contribution of physiotherapy in the realm of exercises, but here our knowledge of the most efficient method of building up muscle power was as yet incomplete. For instance, should it be isotonic or isometric? Should a muscle be stretched or relaxed? How many times should the treatment be repeated and how often?

Finally, Squadron Leader Wynn Parry was of opinion that, if too many patients were being treated in physiotherapy departments, priority must be given to those to whom physiotherapy was essential, and this would include the pre- and post-operative treatment of orthopaedic cases; treatment of neurological disorders; mobilization of stiff joints; re-education of muscle power; and treatment of amputees, of recent injuries, and conditions likely to lead to deformity. If his remarks appeared

too nihilistic, it was because, in his view, physiotherapy had such an important part to play that it should not be abused or rendered ineffective by giving inadequate treatment to too many patients.

Dr. A. T. RICHARDSON, while supporting previous speakers in their plea to rid physiotherapy of useless techniques, felt that the importance of treating the patient as a personality should not be forgotten. While specific treatments must be applied accurately when indicated and treatments known to be useless should be discarded, there was perhaps still a place for techniques of supposed value pending their scientific investigation. To reject all doubtful treatments until such investigation had been completed could only lead to therapeutic nihilism, which did not help the patient. He realized, however, that the present inundation of departments with patients demanded to an increasing extent that doubtful treatments be discarded. He also emphasized the importance, as a basis for the correct use of physiotherapy, of accurate diagnosis and knowledge of the natural history of the condition to be treated. He considered that the physical medicine specialist, with his knowledge of electrodiagnosis, had a particular technical contribution to make to this problem—for example, the treatment of facial palsies could be based only on a knowledge of whether the nerve had degenerated or not. Dr. Richardson felt that knowledge of the results of scientific investigations of physiotherapeutic procedures was not being utilized by physiotherapists. He paid particular tribute to the value of the *Annals of Physical Medicine* and *Archives of Physical Medicine* in publishing the results of research work and welcomed the increasing circulation of these journals in this country.

Dr. F. S. COOKSEY said that there was universal agreement on the need for the scientific investigation of physiotherapeutic procedures; although nothing had been done in the past, quite a lot was going on at present and radical changes in the use of physiotherapy might well occur in the future. Doctors must be bold in discarding methods of treatment which had been superseded or shown to be of little value. On the other hand, scientific investigations would almost certainly confirm and enhance the use of many physiotherapeutic methods, and physiotherapists should realize that more good than harm was likely to come out of the present critical attitude. He considered that physical medicine specialists should have the direction of schools of physiotherapy and should resist pressure to prescribe treatments of little value but which were retained in the examination of physiotherapists on the ground that they might be required by medical practitioners who had not kept abreast of developments. Like Dr. Boyle, he was aware of the difficulties of controlled therapeutic trials. It was, however, becoming clear that physiotherapy to relieve pain and conserve function in chronic and progressive disorders was justified,

but the use of physiotherapy as a placebo or as an expectant treatment to satisfy the patient whilst the medical practitioner carried out investigations or awaited the availability of a bed in hospital could not be too strongly condemned. In his view the greatest abuse of physiotherapy was when it was used by the patient as an escape from social and personal problems.

Dr. G. STOREY briefly reviewed the use of physiotherapy in dermatological and peripheral vascular diseases. He said that, although ultraviolet light had for some time been used in a large number of skin disorders, it had, in fact, only four physiological effects—namely, the production of erythema, tanning, and vitamin D, and some antibacterial effect. Of the various skin diseases which could be treated in the light of these properties only lupus vulgaris appeared to be specifically affected, and such treatment was no longer necessary owing to the introduction of calciferol. In such diseases as psoriasis, alopecia, and acne results were almost always non-specific, and in all these disorders psychological factors were all-important both in treatment and in aetiology. However, in the treatment of varicose ulcers physiotherapy by the Bisgaard technique could play an important and dramatic part.

In the treatment of peripheral vascular disease physiotherapy had little or no part to play and at times could be injurious. Buerger's exercises were of doubtful value and intermittent venous occlusion could do harm. Direct heat and elevation of the limb could be disastrous.

Dr. W. RUSSELL GRANT compared physiotherapy to a drug of addiction and he condemned its prescription as a psychological placebo. He also referred to the way mystery and magic could distract the patient from the important treatment, and gave as an example the overuse of short-wave diathermy in osteoarthritis of the knee, where quadriceps exercises were all-important.

Dr. D. WILSON felt that there was a need for the education of both medical practitioners and the lay public in the use and abuse of physiotherapy. He made the plea, however, that specialists in physical medicine should remember that they were dealing with people who were seeking relief from pain, and should therefore think twice before discarding old methods of treatment until they had found a substitute.

Group Captain C. J. S. O'MALLEY, in supporting the previous speakers, emphasized the value of remedial exercises in stable diseases such as poliomyelitis and post-traumatic cases and pointed out their dangerous potentialities in unstable disabilities.

A. T. RICHARDSON

CLINICAL REPORTS

A CASE OF ACROMEGALIC ARTHROPATHY

In his original paper Marie (1886) described the occurrence of pains in the limbs and joints in cases of acromegaly. Since then there have been many reports of involvement of the locomotor system in this disorder, so that it would seem that this is not uncommon. Kellgren *et al.* (1952) consider that the clinical and radiological features of acromegalic joint disease are so unlike those of any other form of arthropathy that the condition can be regarded as an entity.

According to Kellgren *et al.* there are two clinical types of acromegalic arthropathy. The first, which is uncommon and occurs in long-standing and slowly progressive cases, is characterized by gross limitation of movement in many joints resulting from massive bony outgrowths and deformity of the bone ends. In the second and more common type there are pains in the back and limbs and soft-tissue enlargement of the joints with abnormal mobility, synovial thickening, and recurrent effusions.

The radiological findings are characteristic: there are typically an increase in joint space and a remodelling of the bone ends, which readily distinguish the condition from both rheumatoid arthritis and osteo-arthritis. Tufting of the terminal phalanges and extensive remodelling of the metatarsals and metacarpals are also characteristic findings; the bone ends appear bulbous and atrophic and the necks are lost, while the shafts appear dense and narrow and on occasion "rat-bitten". In some cases the shafts of the long bones are wider than normal. Proliferative and degenerative changes in the costal and vertebral cartilages have been frequently described, and von Meyenburg (1938) has reported similar changes in the trachea and larynx. Nathanson and Losner (1947) have noted ossification of the auricular cartilages.

The following case is considered worthy of record because not only were many of the classic clinical and radiological features of acromegaly with joint changes present, but the symptoms were purely referable to the locomotor system.

Case Report

A woman of 72 complained of pain in the hands, right arm and elbow, shoulders, and knees, swelling of the hands and knees, and stiffness in the knees and shoulders. These symptoms began about three years ago and got progressively worse; pain was first noticed in the shoulders. Her hands and feet had enlarged considerably during the last ten years—she now required shoes and gloves one size larger than she did ten years ago. She had to pass water

two or three times each night, but it was her habit to drink one pint of hot water on retiring.

She was a tall, spare woman weighing 11 st. 1 lb. Features and texture of skin were coarse; nose, tongue, feet, and hands were very large (Plate XLVIII, A). The cardiovascular system appeared to be normal except for a blood pressure of 220/130 mm. Hg. No abnormality was found in the respiratory, alimentary, urogenital, or central nervous system. There were no abnormalities of vision except myopia. There was marked restriction of movement of the shoulders in all directions. The fingers and the backs of the hands were diffusely swollen. The knees also were swollen, and there were pain and crepitus on movement although the movements were not restricted. Erythrocyte sedimentation rate 25 mm. in one hour (Westergren); haemoglobin 90% (13 g. per 100 ml.); W.B.C., 7,700 per c.mm.; serum phosphate 5 mg. per 100 ml. Urine: sp. gr. 1010; acid, no albumin, no sugar.

Radiological Findings.—The pituitary fossa did not appear to be enlarged. There was some hyperostosis frontalis externa. Both shoulders showed gross osteoarthritic changes with loss of joint space, irregularity of the articular margins, subarticular bone sclerosis and marked osteophyte formation. Cystic changes were present in the humeral heads (Plate XLVIII, B). In the hands, tufting of the tips of the terminal phalanges was marked and the muscular attachments on the phalanges were accentuated. Degenerative changes were present in the interphalangeal, metacarpophalangeal, and first carpometacarpal joints of both hands, but the joint spaces were well preserved in the interphalangeal joints and there was widening of the joint spaces in the metacarpophalangeal joints (Plate XLIX, A). The heart was enlarged. No active lung lesion was present. There was a calcified lymph node in the left axilla. Proliferative and degenerative changes were present at the costochondral junctions.

In the cervical region there were disk loss and lipping between C 5 and 6 and degenerative changes in the intervertebral joints. The laryngeal cartilages were calcified. The dorsal spine showed moderate degenerative changes throughout. In the lumbar spine there was lipping throughout with disk loss between L 4 and 5. The abdominal aorta showed some calcification. Osteoarthritic changes were seen in the right hip-joint. Osteoarthritic changes in the knees were severe, but without much loss of joint space. There was some "squaring" of the femoral condyles.

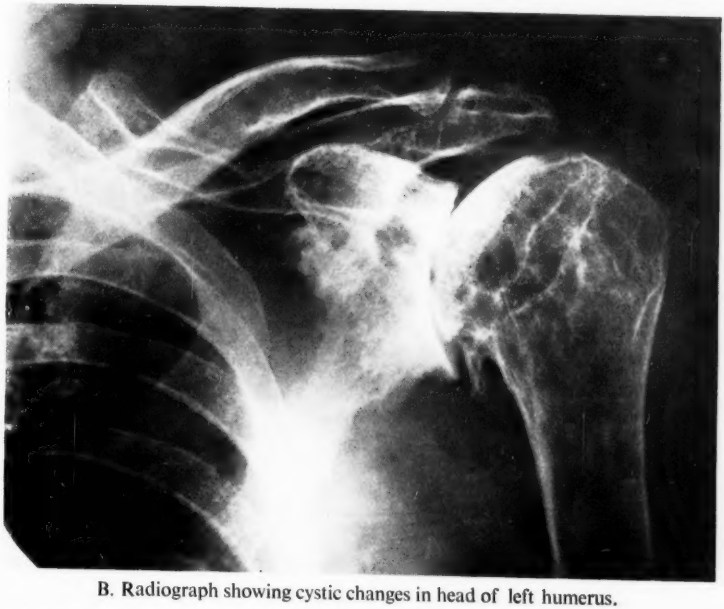
Changes in the feet were similar to those in the hands; in addition the shafts of most of the proximal phalanges were dense and narrow and had a somewhat "rat-bitten" appearance, and the distal ends of the metatarsals were enlarged (Plate XLIX, B).

Almost all the bones examined appeared to be porotic.

Discussion

The appearance of this patient when she first attended the Institute was typical of acromegaly. The history suggests that the acromegalic process began about twelve years ago, when she was 60 years of age, and

A. Patient with acromegalic arthropathy. Note large nose and hands.



B. Radiograph showing cystic changes in head of left humerus.

A. Acromegalic arthropathy: radiograph of hands.

B. Acromegalic arthropathy: radiograph of feet.

the results of investigations and the clinical examination indicate that the disorder has been only slowly progressive and that it may well be dormant now. Certainly there are no visual disturbances to suggest pressure in the region of the optic chiasma—a finding in keeping with the normal radiological appearance of the pituitary fossa. It is felt that her appearance justifies a diagnosis of acromegaly, and, if this were insufficient alone, then the classic radiological findings in hands and feet can leave no reasonable doubt.

The radiological features of acromegalic arthropathy are so clear-cut as to be readily distinguishable from those of other arthropathies, particularly osteoarthritis and rheumatoid arthritis, with which clinically they might be confused. In this respect it is interesting that Decourt *et al.* (1951) have described a typical progressive chronic polyarthritis occurring in an acromegalic patient. These authors conclude that, although it is impossible to eliminate the possibility of the two conditions coexisting, there is considerable experimental evidence to support a relationship between them. Presumably their case is an example of the second type described by Kellgren *et al.*, the case here described being of the first type.

Acknowledgments

My thanks are due to Dr. A. C. Boyle for permission to publish this case and for much helpful criticism, and to Mr. M. Turney of the Photographic Department for the photographs.

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A. R. H. HICKS

Arthur Stanley Institute for Rheumatic Diseases,
Middlesex Hospital.

NEW APPLIANCES

A TURNBUCKLE WALKING CALLIPER

THE splint illustrated (Plate L) was designed to aid the treatment of patients with a fixed flexion deformity of the knee and has been used in several cases with success. When exercises and other forms of treatment have failed, it is sometimes necessary to admit these patients to hospital so that serial plasters or a turnbuckle plaster may be applied. Admission to hospital for the length of time necessary to straighten the knee is expensive, takes up much-needed hospital beds, and inconveniences the patients and their relatives.

This splint will gradually straighten the knee, but at the same time allow the patient to remain ambulant, and bend the knee to sit down and also to carry on active exercises to maintain the tone of the muscles.

Construction

The appliance is a walking calliper which has an adjustable length between the ischial tuberosity and the exchangeable barlock joint at the knee. It has a subcentre box joint with adjustment screw to straighten the angulation of the splint. The length is further adjustable between the knee and the ankle. There is a detachable calf band, and the knee cage is also adjustable. The splint is strong enough to take the patient's weight, even with an angulation of 30 degrees at the knee-joint.

Method of Use

The splint is adjusted so that it fits the patient, and one of the patient's shoes is tubed to receive the shoe calliper. The adjustable screw is turned with an Allen key and the splint is angled to suit the maximum extension obtainable. The patient is then told to adjust the splint daily at home in order to increase extension. It may sometimes be necessary to do this at the hospital, when it can be easily effected without the patient's knowledge, if desired. The barlock joint allows the knee to bend for sitting.

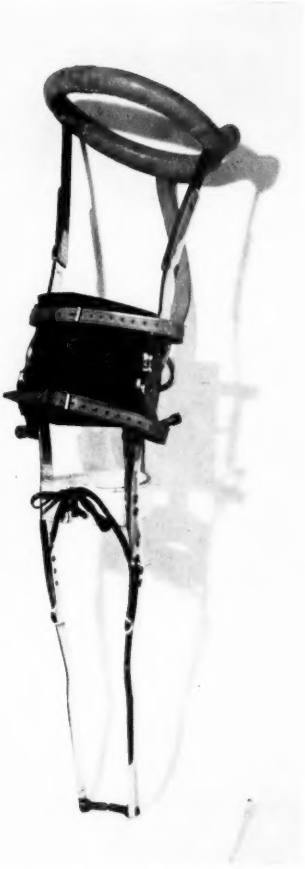
When maximum extension has been obtained, an ordinary walking calliper with a barlock joint is provided, if a calliper is still required, and the appliance can be used again in the department.

Acknowledgment

I would like to thank Messrs. Pryor and Howard for constructing the above appliance.

BRYAN O. SCOTT

Department of Physical Medicine,
Radcliffe Infirmary, Oxford.



A. The turnbuckle walking calliper.

B. Lateral view showing barlock and adjustable subcentre joints.

Double saucepan fitted up for use as wax bath.

[*W.R.G.*

New Appliances

AN INEXPENSIVE WAX BATH

THE setting up of peripheral clinics can, on occasions, prove to be a very expensive matter owing to the cost of equipment. The following improvisation has been found to be entirely satisfactory for the giving of hot wax bath treatment. (See Plate LI.)

It consists of a large-sized double aluminium saucepan which is obtainable in various sizes from Messrs. Pryke and Palmer, of 40/41, Upper Thames Street, London, E.C.4. For the clinics in this area we chose a small size with an internal diameter of 12 inches, the idea being that it would comfortably accommodate a large-sized foot, if necessary. Larger sizes, of course, can be obtained, and for busy central departments a large one would be needed.

The outer container holds approximately three gallons of water and is fitted with an ordinary domestic immersion heater, which is of 3 kilowatt power and contains its own adjustable thermostat. With the thermostat set at about 140° F. we found that a suitable temperature was maintained. A convenient amount of wax to heat in the inner container is 20 lb., and the amount of fixing required is limited to boring one hole in the outer container and screwing in the immersion heater. Fixing it up takes ten minutes at most.

The immersion heater, complete with thermostat, was obtained from the Simplex Electrical Co., Ltd., at a total cost of £3 3s. The cost of the saucepan used was £3, thus making a total of £6 3s.

W. RUSSELL GRANT

Winchester and Salisbury
Hospital Groups.

BOOK REVIEWS

Objectives of the Physical Education Lesson. By M. W. RANDALL and W. K. WAINE. Pp. 120. 10s. 6d. London: G. Bell & Sons, Ltd. 1955.

While there is nothing new in this book, it is a compact collection of most of the recent theories and trends in physical education with the physiological and psychological explanation for their introduction and a discussion by the authors on their merits. The physiology is simplified but accurate, only fatigue being sketchily covered, probably because it is never seen in a physical education lesson, as strengthening exercises are inadequate—a point the authors make. The application of educational theory to practical physical education will give rise to argument, but the opinions expressed are well thought out and worth study.

Vigorous exercise, acquisition of skills, enjoyment and satisfaction, character formation, and development of physique are the objectives discussed, usefully breaking down the physical education lesson even if the last is the only true objective.

This book is not easy to read, but it will provide the physical education student with a most useful survey of current problems, and the qualified teacher with constructive criticism of his teaching methods. It is not applicable to the remedial gymnast or physiotherapist. An index is provided and each chapter is followed by a summary of conclusions and a list of references.

J. M. MILNE

Backache in Women. By E. SCHLEYER-SAUNDERS, M.D., F.I.C.S. Pp. 80. 7s. 6d. Bristol: John Wright and Sons. 1955.

This monograph, written by a gynaecologist, presents his own experience in dealing with this difficult problem. It is unfortunate that the pitfalls inherent in this type of approach have not been avoided and that undue weighting on some aspects has led to deficiency in others. The chapters dealing with gynaecological and orthopaedic backache and the chapter on intervertebral disk lesions especially are excellent; in particular, the author is to be warmly commended for his detailed discussion of the dangers of the lithotomy position and how they can be avoided; but any discussion of the differential diagnosis of backache is incomplete without mention of secondary carcinoma. The chapter on rheumatic backache is rather confused, and it is surprising to see colonic irrigation recommended as a treatment for fibrositis. The short article on coccygodynia is excellent, but the chapter on general rules in the treatment of backache seems to devote a disproportionate amount of space to spa treatment.

By dispensing with the order, accuracy, and completeness of a textbook and putting forward mainly personal views the author has succeeded in producing such stimulating reading that the deficiencies caused by the sacrifices are not realized until the last page is reached.

K. I. PEARCE

ABSTRACTS OF THE LITERATURE

Movements of the Thoracic Cage and Diaphragmatic Respiration. O. L. WADE. *J. Physiol.* (*Lond.*), 1954, **124,** 193.

In this report from the Pneumoconiosis Unit of the Medical Research Council is described a new method of recording and measuring movements of the diaphragm relative to the thoracic cage, by the simultaneous use of X-ray screening of the diaphragm, a mercury-in-rubber transducer to record changes in chest circumference, and a Bowden cable for measuring vertical movement of the chest. It was found that there is close co-ordination between movements of the diaphragm and movements of chest expansion—at no point of deep inspiration or expiration are the two movements dissociated. It was also found that vertical lifting of the thoracic cage is produced mainly by extending the vertebral column, and that this movement plays little part in ventilating the lungs.

Contrary to some teaching (MacMahon, 1934; Asthma Research Council, 1937), no evidence was found that the subjects studied had any separate voluntary control over the diaphragm: movements of the anterior abdominal wall were not found to give a reliable indication of diaphragmatic movements. It is suggested that no cortical control can be exerted over the diaphragm except in so far as there is control over the act of respiration itself. Records taken from a physiotherapist who considered that she could separately control "diaphragm" breathing and "costal" breathing showed that "over a very limited range of ventilation she had considerable control over movements of expansion and contraction of the chest, but diaphragmatic movement was only slightly smaller when she used her 'chest alone' than when she used her 'diaphragm alone', even though she was making very great effort not to use the diaphragm". The main difference which takes place in so-called "costal" and "diaphragmatic" respiration is considered to be due to variation in vertical movement of the thoracic cage, which is brought about by vertebral movement and which plays no part in increasing ventilation.

W. BARLOW

Gout—Now Amenable to Control. E. C. BARTELS. *Ann. intern. Med.*, 1955, **42,** 1.

The author claims to have successfully treated cases of chronic gout with "benemid" (probenicid). Results of long-term treatment of 42 patients are analysed. In 38 cases the serum uric acid was restored to a normal level and maintained there; 15 patients had no further attacks of gout after treatment began, and 24 patients had attacks for the first six to nine months but were free thereafter; tophi became smaller and fistulae closed. Only 3 of the 42 patients did not benefit from the drug. Side-effects—usually allergic reactions such as urticaria and fever—were rare, but severe nausea was also encountered.

Benemid acts by blocking tubular reabsorption of uric acid in the kidneys, resulting in reduction of serum uric acid and possibly the mobilization of urate stores. The effective dose was found to vary from 250 to 3,000 mg. daily; dosage must be regulated by trial and error, starting with an initial dose of

0·5 to 1·0 g. twice daily, and controlled according to the serum uric acid level.

[Follow-up in the present series has extended from 12 to 30 months, but only prolonged observation of a larger number of patients will determine whether the author is justified in comparing benemid in gout to insulin in diabetes. Indications for the use of benemid are still uncertain. Should it be limited to patients with chronic tophaceous gout or used as a prophylactic in mild cases? Is benemid really more effective than salicylates as a uricosuric agent? Whatever the answers to these problems, it seems that we have in benemid a powerful and safe agent for the treatment of chronic gout, and this paper should be read by those who have to treat patients with this disease.]

S. MATTINGLY

Rheumatoid Arthritis and Polyarteritis Nodosa. JOHN BALL. *Ann. rheum. Dis.*, 1954, **13**, 277.

The author discusses the possible interrelationship of rheumatoid arthritis and polyarteritis nodosa, and describes five new cases in which the two conditions occurred together. The changes in the joints themselves were typical of rheumatoid arthritis, while the polyarteritic changes were found in other organs.

G. D. KERSLEY

Muscle Spasm as a Cause of Somatic Pain. D. TAVERNER. *Ann. rheum. Dis.*, 1954, **13**, 331.

Previous papers suggesting muscle spasm as a source of pain in "fibrositis" are discussed. The author found complete electrical "silence" on electromyography in muscles where pain of a fibrositic nature was present, and he considers that the action potential previously found was the result of involuntary muscular contraction due to stimulation by the needle. He emphasizes, however, that tired muscles may be the seat of pain, though muscle spasm, short of cramp, which is not present in fibrositis, is not the cause of such pain.

G. D. KERSLEY

Treatment of Periarthritis of the Shoulder with Hydrocortisone. E. J. CRISP and P. H. KENDALL. *Brit. med. J.*, 1955, **1**, 1500.

The authors describe their experiences in the treatment of the various degenerative inflammatory disorders of the rotator cuff of the shoulder and its adjacent structures [which they have lumped together under the name "periarthritis"] with local injections of hydrocortisone, procaine, and hyaluronidase. They used 50 mg. hydrocortisone plus 1,000 units of hyaluronidase plus 2 to 3 ml. of 2% procaine. Injections were made at three points: anteriorly into the bicipital groove, laterally under the acromion, and posteriorly into the joint [no details of this approach are given]. Of 50 acute cases, 36 (72%) obtained complete relief of symptoms within seven to fourteen days. Of 23 chronic cases with limitation of movement (frozen shoulder) treated by injections followed by exercises, 13 (56%) progressed to complete recovery in four to six weeks.

A. ZINOVIEFF

Abstracts of the Literature

A Review of 650 Hip Arthroplasty Operations. MARGARET M. SHEPHERD. *J. Bone Jt Surg.*, 1954, **36B**, 567.

The author analyses the results obtained in cup arthroplasty and Judet arthroplasty of the hip by members of a research group of the British Orthopaedic Association. Assessment was in terms of pain, range of movement, the patient's evaluation, and an objective estimate of function.

It was found that results were better in unilateral than in bilateral cases, and in the latter were better when only one hip was operated on. Clinical observation showed that there were fewer good results amongst older patients.

Apart from loss of pain, stability and control of the joint were found to be of the greatest value to the patient, but, generally speaking, the greater the range of movement the better the result. An unexpected finding was that the better results were often seen in patients with some degree of residual fixed flexion deformity. It is suggested that, if at operation or shortly afterwards a pre-existing flexion deformity is corrected beyond a certain point, the short muscles close to the joint, which had slowly become adapted, might be overstretched or slackened and thus rendered less capable of performing their main function of stabilizing the joint.

With regard to durability, cup arthroplasty gave the best results at one year and up to four years after operation, but after five years the result was poor in 54%. The results of Judet arthroplasty were good up to two years, and in the period from six months to one year were better than those of cup arthroplasty. But after two years a progressive deterioration was noted, the percentage of poor results rising from 32 at 2–2½ years to 52 at 2½–3 years.

D. J. E. CHESHIRE

Therapeutic Effects of Hot Spring Baths and the Results of Treatment in the Hot Springs of Tiberius. M. BUCHMANN. *Harefuah*, 1953, **45**, 249.

There has been little progress in balneological research during the last few years, the prevailing view being that the virtue of hot medicinal spring water lies in the combination of simple hydrotherapy and the relaxing, restful environment of a health resort. There is, however, evidence of a more specific effect, said to consist of thermal shock influencing in some way the hormonal and vegetative functions, and nowadays referred to as the general adaptation syndrome of Selye.

Recent investigations have shown that those responding favourably to the baths have increased glucocorticoid excretion, while in those who do not respond there is a rise in mineral corticoid excretion. A positive eosinophil response to the stimulus of hot mineral baths is observed.

The results of treatment in the hot springs of Tiberius, Israel, of 1,264 patients suffering from rheumatic disorders are presented, based on a follow-up study of patients who had completed two or more courses. Marked improvement occurred in 40% of the patients, in half of whom it lasted for at least two years. More moderate improvement occurred in another 40%, and in one-fifth of these cases results were permanent or persisted. In the remaining 20% no marked change was apparent.

MYER FISHER

Abstracts of the Literature

Local Hydrocortisone in De Quervain's Disease. B. G. B. CHRISTIE. *Brit. med. J.*, 1955, **1**, 1501.

The author discusses various conservative measures in the treatment of De Quervain's disease, and gives the results of injecting into the tendon sheath 1 ml. (25 mg.) of hydrocortisone after infiltration with 1 ml. of 2% procaine in 20 consecutive cases. Of these, 10 had previously had injections of 1 ml. of 2% procaine hydrochloride alone without lasting success. Cases were followed up for five and a half to fifteen weeks, and during that time 16 patients were "cured" by one injection, another after two injections, and the remaining three had regular relapses so that it was felt that surgery would be required. The only complication was a mild superficial phlebitis in one case.

A. ZINOVIEFF

Localised Osteochondritis of the Lumbar Spine. D. W. LAMB. *J. Bone Jt Surg.*, 1954, **36B**, 591.

Localized osteochondritis of the lumbar spine is associated with low back pain, paravertebral muscle spasm, and restriction of movement. The radiological appearance is of narrowing of a disk space with a characteristic defect of the upper or lower anterior corners of adjacent vertebral bodies. It is suggested that the condition is caused primarily by weakness of the intervertebral disk—either congenital or post-traumatic. Its evolution is described and the importance of differentiating it from spinal tuberculosis stressed.

Seven cases of the disease occurring in children are presented.

D. J. E. CHESHIRE

Conditioning Techniques in the Treatment of Writer's Cramp. L. A. LIVERSEDGE and J. D. SYLVESTER. *Lancet*, 1955, **1**, 1147.

Writer's cramp has hitherto defied any satisfactory aetiological interpretation in terms acceptable to neurologists, psychiatrists, and psychologists, and whatever its origin its persistence might be explained by the establishment of a conditioned reflex. The resemblance between the handwriting in this condition and that observed in certain types of extrapyramidal disease invites the suggestion that this conditioning takes place at subcortical levels.

In the study here described close observation of the development of cramp during the act of writing revealed that it tended to arise when the pen or the writer's hand touched the writing surface, the trigger stimulus being either (*a*) tactile stimulus of the pen or (*b*) tactile stimulus of the hand on the writing surface. The motor effect has two main components, tremor and muscular spasm.

Proceeding on the assumption that a conditioning mechanism was at work, it was decided to disturb the reflex by applying a sensory counter-stimulus whenever the motor effect took place. This took the form of an electrical shock received by the patient while using simple training apparatus as described in the article. The result is described as "deconditioning".

[This procedure should be well worth a trial in our physiotherapy departments.]

J. SHULMAN

GENERAL INDEX

Abstracts of the literature, 28, 62, 108, 145, 185, 221, 267, 305
Acromegalic arthropathy, case reports, 257, 299
Adrenaline, penetration through skin, 44
American Congress of Physical Medicine and Rehabilitation, 1953 session, 53
Anatomy and physiology in teaching and practice of physiotherapy and occupational therapy, 242
Ankle, acute sprain, treatment by hyaluronidase, 95
Appliances, new, *see* New Appliances
ARNOTT, D. C.: Report of joint meeting of B.A.P.M. and Société Belge de Médecine Physique et de Réadaptation, 138
Arthritics, special chair for, 217
Arthritis, chronic gouty, with flexion deformity of knees, case of, 256
——, disabling, the "half-step" or portable staircase for, 23
——, phenylbutazone in, 8
——, rheumatoid, of hands, citrate iontophoresis in, 16
——, ——, phenylbutazone in, 9
——, ——, rehabilitation and discussion at 8th Congress of Ligue Internationale contre le Rhumatisme, 26
Arthropathy, acromegalic, case reports, 257, 299

Backache, pitfalls in diagnosis of, 1
—— in women, review of book on, 304
BACON, G. E., *see* Buckler, W. St. J., joint author
BARLOW, WILFRED: Posture and the resting state, 113
BARNETT, C. H., and HARDING, D.: Activity of antagonist muscles during voluntary movement, 290
Bath aid for disabled, 61
——, wax, inexpensive, 303
BAUWENS, P.: Finger splint for correcting deformity, 22
Bed cradle and foot exercise platform, combined, 22
BELCHER, E. H., and WAND-TETLEY, J. I.: Critical evaluation of syncardial massage, 207
Bicycle, static, 260
Blood flow in limb muscles after constriction of skin vessels, plethysmographic investigation, 128
Book reviews, *see* Reviews of books
BOYLE, A. C.: The scientific approach, 75
BREWERTON, D. A.: Function of vastus medialis muscle, 164
BRITISH ASSOCIATION OF PHYSICAL MEDICINE:
1954 Annual Meeting, 104
—— —— ——, business meeting, 106
—— —— ——, discussion on scientific approach, 75
—— —— ——, social resettlement case conference, 98
1955 Annual Meeting, 261
—— —— ——, business meeting, 264
—— —— ——, discussion on department of physical medicine, 229
—— —— ——, programme, 144
Joint meeting with Société Belge de Médecine Physique et de Réadaptation, 138
BUCKLER, W. ST. J.: Primary generalized osteoarthritis with involvement of sterno-clavicular joints, 180
—— and BACON, G. E.: Haemarthrosis in Christmas disease, 212
——, *see also* Harris, R., joint author
Burn, persistent pain and chronic oedema of foot following, case of, 257
BURT, H. A., FLETCHER, W. D., and MATTINGLY, S.: Pitfalls in diagnosis of backache, 1
"Butazolidin", *see* Phenylbutazone

Calliper, Thomas walking, method of determining efficiency, 214
——, turnbuckle walking, 302
Cassidy case, 39
Cerebral Palsy, Conference on Treatment of, 1954, 43
Chair, special, for arthritics, 217

General Index

Christmas disease, haemarthrosis in, 212
Citrate iontophoresis in rheumatoid arthritis of hands, 16
CLEMMESEN, S.: Tribute to Lord Horder, 276

CLINICAL REPORTS:
Acromegalic arthropathy, report of a case, 299
Haemarthrosis in Christmas disease, 212
Hypertrophic osteoarthritis presenting as polyarthritis, 57
London Hospital, demonstration of cases at, 253
Primary generalized osteoarthritis with involvement of sterno-clavicular joints, 180
Shoulder–hand syndrome following herpes zoster, 132
Social resettlement case conference, 98
University College Hospital, cases demonstrated at, 20

Clinics, inexpensive equipment of, 137
Conference on the Treatment of Cerebral Palsy, 1954, 43
Congress, American, of Physical Medicine and Rehabilitation, 1953 session, 53
——, International, of Physical Medicine, London, 1952, proceedings of, reviewed, 218
——, ——, —— —— ——, 1956, preliminary notice, 263
Connective tissue, discussion at 8th Congress of Ligue Internationale contre le Rhumatisme, 25
COOKSEY, F. S.: Social resettlement case conference report, 98
COYER, A. B.: Citrate iontophoresis in rheumatoid arthritis of hands, 16
——: Plethysmographic investigation into increase in limb muscle blood flow following constriction of skin vessels, 128
Cripples, Central Council for the Care of, study tour, 177
——, International Society for the Welfare of, sixth congress, 182
Current, direct, local vascular effects, 153

DANBURY, R.: Special chair for arthritics, 217
DARCUS, H. D., and WYNN PARRY, C. B.: Anatomy and physiology in the teaching and practice of physiotherapy and occupational therapy, 242
DAVIES, H. RHYS: Phenylbutazone in arthritis, 8
Deltoid paralysis, shoulder abduction with, 178
Department of physical medicine, discussion at B.A.P.M. Annual Meeting, 1955, 229
Diathermy, short-wave, alternative technique of treating hip, 169
——, ——, heating with, tissue clearance of radioactive sodium from skin and muscle during, 248
Diploma in Physical Medicine, course for Part I, notice, 106, 271
Direct current, local vascular effects, 153
Disabled, bath aid for, 61
——, "half-step" or portable staircase for, 23
—— housewife, kitchen units for, 181
—— ——, rehabilitation of, 201
——, rehabilitation and resettlement of, review of book on, 219
—— Service man, resettlement of, 193
——, simple toilet seat for, 103
DOLL, R.: The scientific approach, 85

Education, physical, lesson, objectives of, review of book on, 304
Electricity, medical, for massage students, review of book on, 36
Equipment, inexpensive, for clinics, 137

Fatty tissues in short-wave field, heating of, 48
FELL, W. A.: The department of physical medicine, 232
Finger deformity, splint for correcting, 22
FLETCHER, E., JACOBS, J. H., and ROSE, F. C.: Effect of periarticular procaine infiltration on joint temperature, 123
FLETCHER, W. D., *see* Burt, H. A., joint author
Foot exercise platform and bed cradle combined, 22
FORBES, ROBERT: Physical medicine and the upsurge of medical litigation, 37

Gout, phenylbutazone in, 12
GRANT, W. RUSSELL: Bath aid for the disabled, 61
——: Inexpensive equipment of clinics, 137
——: Inexpensive wax bath, 303
——: Kitchen units for disabled housewives, 181

General Index

Haemarthrosis in Christmas disease, 212
Hands, rheumatoid arthritis of, citrate iontophoresis in, 16
HARDING, D., *see* Barnett, C. H., joint author
HARRIS, R.: "Half-step" or portable staircase, 23
—— and MILLARD, J. B.: Rehabilitation of the disabled housewife, 201
——, WILLIAMS, H. S., and BUCKLER, W. ST. J.: Local vascular effects of histamine iontophoresis and of the direct current, 153
HART, M.: Pain in the neck, 90
Heating of fatty tissues in a short-wave field, 48
Herpes zoster, shoulder–hand syndrome following, 132
HICKS, A. R. H.: Acromegalic arthropathy, report of a case, 299
Hip, osteoarthritis of, discussion at 8th Congress of Ligue Internationale contre le Rhumatisme, 26
——, —— ——, phenylbutazone in, 13
——, treatment with short-wave diathermy, alternative technique, 169
Histamine iontophoresis, local vascular effects, 153
Horder, Lord: his views on physical medicine, 277
——, obituary notice of, 272
——, tributes to, 273
Hospitals and the law, 38
Housewives, disabled, kitchen units for, 181
——, ——, rehabilitation of, 201
Howitt, F. D., obituary of, 73
Hubbard tank, hydraulic platform to permit progressive resisted exercises in, 135
Hyaluronidase treatment of acute sprained ankle, 95
Hydrarthrosis, intermittent (? rheumatoid arthritis), case of, 255
Hypopituitarism with slipped femoral epiphysis, case of, 255

Iontophoresis, citrate, in rheumatoid arthritis of hands, 16
——, histamine, local vascular effects, 153

JACOBS, J. H., *see* Fletcher, E., joint author
Joint temperature, effect of periarticular procaine on, 123

KENDALL, P. H.: Hyaluronidase in treatment of acute sprained ankle, 95
KININMONTH, D. A.: A new static bicycle, 260
——: Report of demonstration of cases before British Association of Physical Medicine, 20
Kitchen units for disabled housewives, 181
Knee cage, adjustable, 60
Krusen, F. H., receives National Presidential Award, 59
KRUSEN, F. H.: Tribute to Lord Horder, 274

Law, hospitals and, 38
——, physical medicine department and, 40
LAWRENCE, J. S., and SLADDEN, R. J.: Value of physiotherapy in rheumatic diseases, 282
Leprosy, demonstration of two cases, 20
Ligue Internationale contre le Rhumatisme, 8th Congress, Geneva, 25
Litigation, medical, upsurge of, physical medicine and, 37
——, steps to reduce risk of, 42
London Hospital, demonstration of cases at, 253
Lupus erythematosus, disseminated, with amyloid disease, case of, 253

MARTIN, GORDON M.: American Congress of Physical Medicine and Rehabilitation, 1953 session, 53
Massage students, medical electricity for, review of book on, 36
——, syncardial, critical evaluation, 207
MATTINGLY, S.: Hypertrophic osteoarthropathy presenting as polyarthritis, 57
——, *see also* Burt, H. A., joint author
Medical litigation, upsurge of, physical medicine and, 37
Medicine, orthopaedic, review of book on, 143
——, physical, *see* Physical medicine
MILLARD, J. B.: Changes in tissue clearance of radioactive sodium from skin and muscle during heating with short-wave diathermy, 248
——: Simple toilet seat for disabled, 103
——, *see also* Harris, R., joint author

General Index

MILLIGAN, J. L., and WYNN PARRY, C. B.: Resettlement of the disabled Service man, 194
Movement, voluntary, activity of antagonist muscles during, 290
Muscle bood flow in limbs following constriction of skin vessels, plethysmographic investigation, 128
—— spindle system, 115
——, tissue clearance of radioactive sodium from, during heating with short-wave diathermy, 248
Muscles, antagonist, activity during voluntary movement, 290
Myotonia congenita, demonstration of case, 21

Neck, pain in, 90
NEW APPLIANCES:
Arthritics, special chair for, 217
Bath aid for disabled, 61
Bed cradle and foot-exercise platform, combined, 22
Finger splint for correcting deformity, 22
"Half-step" or portable staircase, 23
Hydraulic platform to permit progressive resisted exercises in a Hubbard tank, 135
Inexpensive equipment of clinics, 137
—— wax bath, 303
Kitchen units for disabled housewives, 181
Knee cage, adjustable, 60
Plastic splint material directly adaptable to skin, 101
Static bicycle, 260
Thomas walking calliper, method of determining efficiency of, 214
Toilet seat, simple, for disabled, 103
Turnbuckle walking calliper, 302
Universal traction frame and lumbar traction harness, 258
NICHOLS, P. J. R.: An adjustable knee cage, 60
——: Penetration of adrenaline through the skin, 44
North and Midlands Physical Medicine Club, formation and first meeting, 152

OBITUARY:
Horder, Lord, 273
Howitt, F. D., 73
Occupational therapy, anatomy and physiology in teaching and practice of, 242
Ointments, rubefacient, comparison by skin temperature estimations, 174
Orthopaedic appliances and aids, demonstration of, 21
—— medicine, review of book, on, 143
Osteoarthritis, cervical and lumbar, phenylbutazone in, 13
—— of hip, discussion at 8th Congress of Ligue Internationale contre le Rhumatisme, 26
—— —— ——, phenylbutazone in, 13
——, primary generalized, with involvement of sterno-clavicular joints, 180
Osteoarthropathy, hypertrophic, presenting as polyarthritis, 57
Oxycephaly, Klippel–Feil syndrome, and cervical spondylosis, case of, 254

Paget's disease of bone, phenylbutazone treatment, 14
Pain due to sacro-iliac disease, pitfalls in diagnosis of, 6
—— —— —— vertebral disease, pitfalls in diagnosis of, 4
—— in neck, 90
——, retroperitoneal, pitfalls in diagnosis of, 1
Palsy, Cerebral, Conference on Treatment of, 1954, 43
Paralysis, deltoid, shoulder abduction with, 178
PARRY, C. B. WYNN, *see* Wynn Parry
Periarthritis of shoulder, phenylbutazone in, 13
Phenylbutazone in arthritis, 8
——, discussion at 8th Congress of Ligue Internationale contre le Rhumatisme, 26
——, side-effects, 14
—— toxicity, demonstration of case, 20
Physical education lesson, objectives of, review of book on, 304
—— Medicine and Rehabilitation, American Congress of, 1953 session, 53
—— —— —— ——, review of book on, 35
—— —— —— the upsurge of medical litigation, 37
—— ——, British Association of, *see* British Association of Physical Medicine
—— —— Club, North and Midlands, formation and first meeting, 152

Physical medicine department and the law, 40
—— —— ——, discussion at B.A.P.M. Annual Meeting, 1955, 229
—— ——, Diploma in, course for Part I, notice, 106, 271
—— ——, International Congress of, London, 1952, proceedings of, reviewed, 218
—— ——, Lord Horder's views on, 277
—— ——, Second International Congress of, preliminary notice, 179
—— Therapy, World Confederation for, First Congress, London, 27
—— ——, —— —— ——, —— ——, proceedings of, reviewed, 183
Physiology, anatomy and, in teaching and practice of physiotherapy and occupational therapy, 242
Physiotherapy, anatomy and physiology in teaching and practice of, 242
—— in rheumatic diseases, value of, 282
——, use and abuse of, discussion at Royal Society of Medicine, 294
Plastic splint directly adaptable to skin, 101
Platform, hydraulic, to permit progressive resisted exercises in a Hubbard tank, 135
Polyarthritis, hypertrophic osteoarthropathy presenting as, 57
Posture and the resting state, 113
Procaine, periarticular, effect on joint temperature, 123

Radiography in diagnosis of neck pain, 93
Rehabilitation and resettlement of disabled, review of book on, 219
—— centre, proposed, in Montreal, review of book on, 72
—— centres in the U.S.A., review of book on, 71
—— in rheumatoid arthritis, discussion at 8th Congress of Ligue Internationale contre le Rhumatisme, 26
—— of disabled housewife, 201
—— —— —— Service man, 193
——, Physical Medicine and, American Congress of, 1953 session, 53
——, —— —— ——, review of book on, 35
Resettlement, social, case conference before 1954 Annual Meeting of B.A.P.M., 98
Respiratory function, management in disease, review of book on, 71
Resting state, posture and, 113
Retroperitoneal pain, pitfalls in diagnosis of, 1

Reviews of Books:
Atlas de Radio-rhumatologie, by François Francon and Pierre Faidherbe, 184
Backache in Women, by E. Schleyer-Saunders, 304
Comment Traiter la Sciatique, by J. A. Lièvre, 220
Medical Electricity for Massage Students, by H. Morris, 36
Objectives of the Physical Education Lesson, by M. W. Randall and W. K. Waine, 304
Orthopaedic Medicine, Textbook of, by James Cyriax, 143
Physical Medicine and Rehabilitation, ed. by B. Kiernander, 35
Proceedings of the International Congress of Physical Medicine, London, 1952, 218
Rehabilitation Centre, the, by G. Gingras, Leo Dallain, and M. Mongeau, 72
—— Centres in the United States, by Henry Redkey, 71
—— and Resettlement of Disabled Persons, 219
Respiratory Function—Management in Disease, by Richard D. Tonkin, 71
Shoulder Lesions, by H. F. Mosley, 2nd ed., 107
Textbook of Rheumatic Diseases, by W. S. C. Copeman, 265
World Federation for Physical Therapy, Proceedings of the First Congress, 183

Rheumatic diseases, review of book on, 265
—— ——, value of physiotherapy in, 282
Rheumatism: Ligue Internationale contre le Rhumatisme, 8th Congress, Geneva, 25
Rheumatoid arthritis, *see* Arthritis, rheumatoid
Rheumatology, radiological atlas of, review of, 184
Rhys Davies, *see* Davies
Richardson, A. T.: B.A.P.M. eleventh Annual Meeting report, 104
——: Report of discussion on use and abuse of physiotherapy at Royal Society of Medicine, 294
——: Shoulder–hand syndrome following herpes zoster, 132
——: The department of physical medicine, 236
——: The scientific approach, 80
Rose, F. C., *see* Fletcher, E., joint author
Rubefacient ointments, comparison by skin-temperature estimations, 174
Russell Grant, *see* Grant

General Index

Sacro-iliac disease, pain due to, pitfalls in diagnosis of, 6
Sciatica, treatment of, review of book on, 220
Scientific approach, discussion on, at 1954 annual meeting of B.A.P.M., 75
SCOTT, B. A.: alternative technique of treating the hip with short-wave diathermy, 169
——: Heating of fatty tissues in a short-wave field, 48
——: Turnbuckle walking calliper, 302
——: Universal traction frame and lumbar traction harness, 258
Short-wave diathermy, alternative technique of treating hip, 169
—— ——, heating of fatty tissues in field of, 48
Shoulder–hand syndrome following herpes zoster, 132
Shoulder lesions, review of book on, 107
——, periarthritis of, phenylbutazone in, 13
Skin, penetration of adrenaline through, 44
——, plastic splint material adaptable to, 101
—— temperature estimation to compare rubefacient ointments, 174
——, tissue clearance of radioactive sodium from, during heating with short-wave diathermy, 248
—— vessels, constriction of, limb muscle blood flow after, plethysmographic investigation, 128
SLADDEN, R. J., *see* Lawrence, J. S., joint author
Social resettlement case conference before 1954 annual meeting of B.A.P.M., 98
Société Belge de Médecine Physique et de Réadaptation, joint meeting with B.A.P.M., 138
Society, International, for the Welfare of Cripples, sixth congress, 182
SOMMERVILLE, J. G.: A method of determining the efficiency of a Thomas walking calliper, 214
Splint for correcting finger deformity, 22
——, plastic, directly adaptable to skin, 101
Spondylitis, ankylosing, demonstration of case, 20
——, ——, phenylbutazone in, 12
STEINBERG, V. L.: Demonstration of cases at London Hospital, 253
Sterno-clavicular joint involvement in primary generalized osteoarthritis, 180
Steroids, discussion at 8th Congress of Ligue Internationale contre le Rhumatisme, 25
STEWART, J. B.: Combined bed cradle and foot exerciser, 22
——: Hydraulic platform to permit progressive resisted exercises in a Hubbard tank, 135
SYMONS, H. F. B.: Comparison of rubefacient ointments by skin temperature estimations, 174
Syncardial massage, critical evaluation, 207

TEGNER, W. S.: The department of physical medicine, 229
Temperature, joint, effect of periarticular procaine on, 123
Thomas walking calliper, method of determining efficiency of, 214
Tissue clearance of radioactive sodium from skin and muscle during heating with short-wave diathermy, 248
Toilet seat, simple, for disabled, 103
Traction frame and lumbar traction harness, universal, 258
Turnbuckle walking calliper, 302

U.S.A.: American Congress of Physical Medicine and Rehabilitation, 1953 session, 53
——, rehabilitation centres in, review of book on, 71

VAN SWAAY, H.: Plastic splint material directly adaptable to the skin, 101
Vascular effects of histamine iontophoresis and direct current, 153
Vastus medialis, function of, 164
Vertebra, pain due to disease of, pitfalls in diagnosis, 4

WAND-TETLEY, J. I., *see* Belcher, E. H., joint author
Wax bath, inexpensive, 303
WILLIAMS, H. S., *see* Harris, R., joint author
Women, backache in, review of book on, 304
Woods, Sir Robert Stanton, notice of death, 192
World Confederation for Physical Therapy, First Congress, London, 27
WYNN PARRY, C. B.: Shoulder abduction with deltoid paralysis, 178
——, *see also* Darcus, H. D., joint author; Milligan, J. L., joint author

ABSTRACTS SUBJECT INDEX

Absence from work, prolonged, need for physical treatment during, 108
Achilles tenotomy, subcutaneous, in treatment of intermittent claudication, 30
ACTH, *see* Corticotrophin
Adolescent kyphosis, 65
Adrenal cortex, chrysotherapy and, 69
Aged, care of, practical considerations, 30
Amputees, rehabilitation of, psychological aspects, 29
Anxiety, physiological changes in muscular system accompanying, 224
Aponeurosis, plantar, and arch, mechanics of, 62
Arch support in shoes, inadequate, 186
Arm, electromyography in study of kinesiology of, 28
Arterial disease, peripheral, points of common interest to general and orthopaedic surgery, 185
Arthritis, procaine injections for, 145
——, rheumatoid, cortisone and codeine as adjuvants to manipulation in, compared, 68
——, ——, degenerative type, 191
——, ——, early, cortisone and aspirin treatments compared, 190
——, ——, electromyogram in, 149
——, ——, phenylbutazone treatment, 189
——, ——, and polyarteritis nodosa, 306
——, ——, prolonged cortisone treatment in management, 189
——, ——, rehabilitation of patients, 190
——, ——, restoration of function of knee-joint in, 112
——, ——, treatment by transfusions of blood from pregnant women, 226
——, ——, ultrasonics in, 268
Arthroplasty of elbow, end-results, 111
—— —— hip, assessment of function after, 225
—— —— ——, femoral-head, 147
—— —— ——, results in 650 cases, 307
Arthrotomy of knee, rehabilitation after, 110
Aspirin compared with cortisone in early rheumatoid arthritis, 190
Atrophy of limb in rat, metabolism of, 187
——, muscular, due to acute inanition, effect of electrical stimulation on, 63
——, ——, effect of immobilization on, 35

Back pain, low, place of manipulation in relief of, 228
Baths, hot spring, therapeutic effects, 307
"Benemid", *see* Probenicid
Biophysics of junctional transmission, 221
Blood, *see also* Circulation
—— flow, effect of immobilization on, 35
—— —— in skeletal muscle, effect of electrical stimulation on, 28
—— transfusions from pregnant women in rheumatoid arthritis, 226
Brace, ischial weight-bearing, in treatment of Legg–Perthes disease, 33
Brachial neuralgia with cervical spondylarthrosis, 148
Brain, *see* Cerebral
"Butazolidin", *see* Phenylbutazone

Cerebral flaccid-spastic syndrome, infantile, neuromuscular re-education in, chain-synergies in, 150
—— palsy, 187
—— ——, children with, hip derangements in, 149
Cerebrovascular lesions, acute focal, factors influencing prognosis, 148
Cervical disk syndrome, conservative treatment, 188
—— nerve root irritation, traction for, 188
—— osteochondrosis, extension treatment, 66
Chain-synergies in neuromuscular re-education in infantile cerebral flaccid-spastic syndrome, 150
Chest diseases, physiotherapy and, 271
Children, play-pen to teach them to walk correctly, 192
——, poliomyelitis in, convalescence from, 191

Abstracts Subject Index

Chrysotherapy, adrenal cortex and, 69
Circulation, influence of frequency of muscle stimulation, 33
—— of extremities, effect of venous compression on, 146
Claudication, intermittent, subcutaneous Achilles tenotomy as aid to treatment, 30
Clubfoot, congenital, conservative management, 228
Codeine and cortisone compared as adjuvants to manipulation in rheumatoid arthritis, 68
Colles's fracture, end-results of treatment, 112
Compound F, *see* Hydrocortisone
Convalescence from poliomyelitis in children, 191
Corticotrophin and cortisone, experiences with, in various conditions, 145
—— treatment of Hill's disease, 109
Cortisone and ACTH, experiences with, in various conditions, 145
—— —— codeine medication compared as adjuvants to manipulation in rheumatoid arthritis, 68
—— as adjunct in rehabilitation of hemiplegic, 34
—— compared with aspirin in early rheumatoid arthritis, 190
——, oral, therapy of periarthritis of shoulder, 228
—— treatment of painful shoulder, 68
—— ——, prolonged, in management of rheumatoid arthritis, 189
—— —— of Still's disease, 109
—— ——, vertebral collapse after, 227
Crutch handpiece, tilted, 35
Cysts of semilunar cartilages of knee-joints, 110

Diaphragm, movements during respiration, thoracic cage and, 305
Diathermy, microwave, and healing of experimental fractures, 70
Disabled, employment and placing of, 34
Disk, cervical, syndrome, conservative treatment for, 188
——, intervertebral, nuclear herniations of, radiological manifestations, 226
——, lumbar intervertebral, structural changes in, 188
Dystrophy, reflex sympathetic, of upper extremity, incidence, 63

Elbow, arthroplasty of, end-results, 111
——, "pulled", 191
Electrical stimulation, effect on blood flow and temperature of skeletal muscle, 28
—— ——, —— —— muscular atrophy due to acute inanition, 63
—— ——, repetitive, in control of heart action, 63
Electromyogram in rheumatoid arthritis, 149
Electromyography in study of kinesiology of upper limb, 28
——, ureteral, in congenital megaloureter, 69
Employment and placing of disabled persons, 34
Exercises, resisted, in poliomyelitis, 28
Extension treatment of cervical osteochrondrosis, 66

Femur head, vascular anatomy, 185
Foot arches, muscular control in standing, 224
—— as a half-dome, 224
——, immersion, physiopathology, 64
——, mechanics of, 62
—— muscles, electromyographic study, 187
Fracture, Colles's, end-results of treatment, 112
Fractures, experimental, microwave diathermy and healing of, 70
Funicular suture and exclusion in repair of severed nerves, 186

Genetic aspects of disseminated sclerosis, 62
Geriatrics, ultrasonics in, 268
Gold therapy, adrenal cortex and, 69
Gout, chronic, sodium salicylate and probenicid therapy, 226
——, probenicid treatment, 305

Hand, lumbrical muscles of, function, 221, 270
Headache, muscles in aetiology of, 186
Heart action, control by repetitive electrical stimuli, 63
—— disease, rehabilitation of patient with, 150
Hemiplegic, rehabilitation of, cortisone as adjunct in, 34

Abstracts Subject Index

Hip abductors, weakness of, iliopsoas transfer for, 29
——, acrylic femoral-head arthroplasty of, 147
—— arthroplasty, assessment of function after, 225
—— ——, results in 650 cases, 307
—— derangements in cerebral palsied children, 149
——, injection into, anatomical considerations, 228
Hydrocortisone treatment of De Quervain's disease, 308
—— —— —— painful shoulder, 68
—— —— —— periarthritis of shoulder, 306

Iliopsoas transfer for weakness of hip abductors, 29
Immersion foot, physiopathology, 64
Immobilization, effect on muscular atrophy and blood flow, 35
Inanition, acute, muscle atrophy due to, effect of electrical stimulation on, 63
Injuries, industrial, rehabilitation of, in Ontario, 151
Intervertebral disk, lumbar, structural changes in, 188
—— ——, nuclear herniations of, radiological manifestations, 226
—— ——, ruptured, rehabilitation after operation for, 66
Intestine, small, effect of physical training on propulsive motility, 270
Iontophoresis, reverse, sodium–potassium ratio of skin obtained by, 65

Junctional transmission, biophysics of, 221

Kidney function, phenylbutazone and, 226
Kinesiology of upper limb, electromyography in study of, 28
Knee, arthrotomized, rehabilitation of, 110
——, cysts of semilunar cartilages of, 110
—— in rheumatoid arthritis, restoration of function, 112
Kyphosis, adolescent, 65

Leg muscles, electromyographic study, 187
Legg–Perthes disease, treatment by traction and ischial weight-bearing brace, 33
Ligaments, supraspinous and intraspinous, tension in, during flexion and extension of vertebral column, 224
Limb atrophy in rat, metabolism of, 187
Lumbar intervertebral disks, structural changes in, 188
—— vertebral canal, developmental narrowing of, radicular syndrome due to, 223
Lumbrical muscles of hands, functions of, 221, 270

Manipulation in relief of low back pain, 228
—— —— rheumatoid arthritis, cortisone and codeine as adjuvants to, compared, 68
Medicine, physical, future of, 108
Megaloureter, congenital, ureteral electromyography in, 69
Microwave diathermy and healing of experimental fractures, 70
—— —— in periarthritis of shoulder, comparison with ultrasonics, 269
Muscle(s) atrophy due to acute inanition, effect of electrical stimulation on, 63
—— ——, effect of immobilization on, 35
——, clearance of radioactive sodium from, in normals and in peripheral vascular disease, 64
—— in aetiology of headache, 186
——, leg and foot, electromyographic study, 187
——, lumbrical, of hands, functions of, 221, 270
——, physiological changes in, accompanying anxiety and tension, 224
——, skeletal, effect of electrical stimulation on blood flow and temperature of, 28
——, ——, question of tonus in, 31
—— spasm as cause of somatic pain, 306
—— stimulation, influence of frequency on circulation, 33
—— strength, recovery after poliomyelitis, 67

Nerve root irritation, cervical, traction for, 188
Nerves, severed, funicular suture and exclusion in repair of, 186
Neuralgia, brachial, with spondylarthrosis cervicalis, 148
Neuritis, serum, 31
——, ultrasonics in, 268
Neurological disturbances, extenso-progressive reflex, following trauma, 109

Abstracts Subject Index

Ontario, rehabilitation of industrial injuries in, 151
Osteitis condensans ilii, 148
—— —— ——, differentiation from ankylosing spondylitis, 225
Osteoarthritis, ultrasonics in, 268
Osteochondritis, localized, of lumbar spine, 308
Osteochondrosis, cervical, extension treatment, 66

Pain associated with acute poliomyelitis, 223
——, low back, place of manipulation in relief of, 228
——, somatic, muscle spasm as cause of, 306
Palsy, cerebral, 187
Periarthritis of shoulder, hydrocortisone treatment, 306
—— —— ——, oral cortisone therapy, 228
—— —— ——, ultrasonics compared with microwave diathermy in, 269
Phenylbutazone and renal function, 226
—— in rheumatic conditions, 145
—— toxicity, multiple visceral lesions due to, 226
—— treatment of rheumatoid arthritis, 189
Physical medicine, future of, 108
—— therapy, chest diseases and, 271
—— ——, group work in, 31
—— ——, need for, during prolonged absence from work, 108
—— training, effect on propulsive motility of small intestine, 270
Plantar aponeurosis and arch, mechanics of, 62
Play-pen to train children to walk correctly, 192
Poliomyelitis, acute, pain associated with, 223
—— in children, convalescence from, 191
——, recovery of muscular strength after, 67
——, resisted exercises in treatment, 28
Polyarteritis nodosa, rheumatoid arthritis and, 306
Potassium–sodium ratio of skin obtained by reverse iontophoresis, 65
Probenicid and sodium salicylate therapy of chronic gout, 226
—— treatment of gout, 305
Procaine injections in arthritic conditions, 145
"Pulled elbow", 191

De Quervain's disease, 271
—— ——, hydrocortisone treatment, 308

Radicular syndrome due to developmental narrowing of lumbar vertebral canal, 223
Radiculitis, cervical, 268
Radius head, partial dislocation of ("pulled elbow"), 191
Re-education, neuromuscular, in infantile cerebral flaccid-spastic syndrome, chain-synergies in, 150
Rehabilitation after operation for ruptured intervertebral disk, 66
—— of amputees, psychological aspects, 29
—— —— arthrotomized knee, 110
—— —— hemiplegic, cortisone as adjunct in, 34
—— —— industrial injuries in Ontario, 151
—— —— injured workman, 151
—— —— patient with heart disease, 150
—— —— —— —— rheumatoid arthritis, 190
Repetimeter, 30
Respiration, diaphragmatic, movements of thoracic cage and, 305
Rheumatic conditions, phenylbutazone treatment, 145
Rheumatoid arthritis, *see* Arthritis

Scleroderma, 147
——, radiological manifestations, 147
Sclerosis, disseminated, genetic aspects, 62
Scoliosis, idiopathic, 66
Semilunar cartilages of knee-joints, cysts of, 110
Serum neuritis, 31
Shoes, inadequate arch support in, 186
Shoulder–hand syndrome, incidence, 63

Abstracts Subject Index

Shoulder, painful, cortisone and hydrocortisone treatment, 68
——, periarthritis of, hydrocortisone treatment, 306
——, —— ——, oral cortisone therapy, 228
——, —— ——, ultrasonics compared with microwave diathermy in, 269
Sjögren's syndrome, 62
Skeletal muscle, effect of electrical stimulation on blood flow and temperature of, 28
—— ——, the question of tonus in, 31
Skin, sodium–potassium ratio of, obtained by reverse iontophoresis, 65
—— vascular response to ultraviolet light, 221
Sodium–potassium ratio of skin obtained by reverse iontophoresis, 65
Sodium, radioactive, clearance from muscle in normals and in peripheral vascular disease, 64
—— salicylate and probenicid therapy of chronic gout, 226
Spasm, muscle, as cause of somatic pain, 306
Spinal cord, experimental transection of, return of function after, 32
—— —— injury, early management, 67
Spine, *see also* Vertebral
——, lumbar, localized osteochondritis of, 308
——, tension in supraspinous and interspinous ligaments during flexion and extension, 224
Spondylarthrosis cervicalis with brachial neuralgia, 148
Spondylitis, ankylosing, differentiation from osteitis condensans ilii, 225
——, ——, histological, clinical, and radiological findings, 225
——, ——, ultrasonics in, 268
Spondylosis: the known and the unknown, 222
Still's disease, ACTH and cortisone treatment, 109
Stimulation, electrical, effect on blood flow and temperature of skeletal muscle, 28
—— of muscle, influence of frequency of, on circulation, 33

Temperature of skeletal muscle, effect of electrical stimulation on, 28
Tendovaginitis stenosans, 271
Tenotomy, Achilles, subcutaneous, in treatment of intermittent claudication, 30
Tension, muscular, physiological changes in muscular system accompanying, 224
Thermal properties of human tissues, measurement of, 270
Thoracic cage, respiratory movements of diaphragm and, 305
Tiberius, Israel, hot springs of, results of treatment in, 307
Tissues, human, measurement of thermal properties, 270
Tonus in skeletal muscle, 31
Traction for cervical nerve root irritation, 188
—— in treatment of Legg–Perthes disease, 33
Transection of spinal cord, experimental, return of function after, 32
Transmission, junctional, biophysics of, 221
Trauma, extenso-progressive reflex neurological disturbances after, 109

Ultrasonics, contraindications and complications, 268
—— in periarthritis of shoulder, comparison with microwave diathermy, 269
——, present position, 152
——, symposium on, 267
Ultraviolet light, vascular response of skin to, 221
Ureteral electromyography in congenital megaloureter, 69

Vascular anatomy of femoral head, 185
—— disease, peripheral, clearance of radioactive sodium from muscle in, 64
—— response of skin to ultraviolet light, 221
Venous compression, effect on circulation of extremities, 146
Vertebral canal, lumbar, developmental narrowing of, radicular syndrome due to, 223
—— collapse after cortisone therapy, 227
Viscera, multiple lesions of, due to phenylbutazone toxicity, 226

Workman, injured, rehabilitation of, 151
Writer's cramp, conditioning techniques in treatment of, 308

X-ray manifestations of scleroderma, 147

ABSTRACTS AUTHOR INDEX

ABRAMSON, A. S., 110
AITKEN, A. P., 191
ALDES, J. H., 66, 267
AXFORD, M., 151

BACKHOUSE, K. M., 221, 270
BAKER, R., 69
BALL, J., 306
BARBER, H. S., 191
BARTELS, E. C., 305
BASMAJIAN, J. V., 187
BAUER, A. W., 152
BEGG, A. C., 226
BEHREND, H. J., 267
BENDZ, P., 223
BENJAMIN, F. B., 65
BENNETT, W. A., 70
BENTON, J. G., 34
BENTZON, J. W., 187
BLOCKEY, N. J., 228
BONNIN, J. G., 110
BOUMAN, H. D., 267
BOURNE, L. B., 34
BRAIN, R., 222
BRODISH, A., 63
BROWN, H., 34
BUCHMANN, M., 307

CATTON, W. T., 221, 270
CHAMBERS, G. H., 186
CHRISTIE, B. G. B., 308
CICENIA, E. F., 31
COGGANS, W. H., 63
COLINET, E., 190
COOPER, I. S., 67
COPEMAN, W. S. C., 189
CORBIN, K. B., 188
COVALT, D. A., 67
COVENTRY, M. B., 68
CRAIG, J. G., 228
CREGAN, J. C. F., 191
CRISP, E. J., 306
CULLINAN, E. R., 147

DAMERON, T. B., 65
DASCO, M. M., 28
DEVIAS, G. V., 29
DODDS, C., 189
DOERNER, A. A., 34
DUSSIK, K. T., 267

EDMUNDSON, F. B., 267
EDWARDS, J. E., 270
EGELIUS, N., 145
ENGFELDT, B., 225
ERICKSON, D. J., 269

FATT, P., 221
FEARNLEY, M. E., 189
FISCHER-WILLIAMS, M., 67
FORSYTH, C. C., 109, 145
FREEMAN, L. W., 32

GERBODE, F., 63
GERSTEN, J. W., 267
GIBSON, H. J., 191
GIBSON, J. J., 224
GLYN, J. H., 189
GRABINSKI, S., 267
GREENE, L., 34
GRILL, C., 148
GRYNBAUM, B. B., 267
GULLEDGE, W. H., 65

HARDY, J. D., 270
HARPER, R. A. K., 147
HARRIS, R. I., 188
HARRISON, M. H. M., 185
HENDERSON, E. D., 70
HERNDON, C. H., 33
HERRICK, J. F., 70
HERROD, C. E., 63
HERZMARK, M. H., 192
HESS, H. H., 270
HEYMAN, C. H., 33
HICKS, J. H., 62
HINES, H. M., 28, 35, 63
HIRSCHBERG, G. G., 28
HOBERMAN, M., 31
HOCHHAUSER, E., 150
HOEN, T. I., 67
HORDER, LORD, 108

IMIG, C. J., 28, 35
IVY, A. C., 65

JADESON, W. J., 267
JAMES, J. I. P., 66
JEZER, A., 150
JOHNSON, B. MCD., 226
JONES, A. C., 267
JONES, M. H., 149
JOSEPHS, C., 226

KARA, A., 34
KELLGREN, J. H., 228
KEMPEN, R., 65
KENDALL, P. H., 306
KENDRICK, R., 186
KERSLEY, G. D., 191
KIERNANDER, B., 108
KNIGHT, R. A., 111
KOBAK, D., 267
KOERNER, F., 66
KOUMANS, A. K. J., 228
KRUSEN, F. H., 269
KUITERT, J. H., 267
KUHLMANN, F., 66, 228

LAINE, V. A. I., 63
LAMB, D. W., 308
LANDSMEER, J. M. F., 228
LARKIN, I. M., 226
LEE, R. H., 63
LEHMANN, J. F., 269
LIBET, B., 31
VAN LIERE, E. J., 270
LIPKIN, M., 270
LITTMAN, D. S., 30
LIVERSEDGE, L. A., 308
LOWE, C. R., 108
LUDER, J., 227

MCCOMBS, R. K., 63
MCKENZIE, J., 224
MCKEOWN, T., 108
MACNAB, I., 188
MAGILL, H. K., 191
MALONE, W., 35
MANSON, M. P., 29
MARMION, D. E., 186
MARSON, F. G. W., 226
MARTIN, G. M., 188, 269
MASON, M. L., 112
MATHEWS, S. S., 149
MEAD, S., 149, 267
MEDICAL RESEARCH COUNCIL and NUFFIELD FOUNDATION: Joint Committee on Cortisone and A.C.T.H. in Chronic Rheumatic Diseases, 68, 190
MICHEZ, J., 190
MILLIKEN, C. H., 148
MOESCH, F. P., 148
MONTGOMERY, H., 64
MORGAN, A. D., 62
MUELLER, E. E., 149
MUELLER, E. M., 267
MULDER, A. G., 65
MULLER, R., 62
MUSTARD, W. T., 29

NASSIM, J. R., 226
NEWMAN, M. K., 267
NISBET, N. W., 147, 270
NISBETT, H., 30
NYSTRÖM, G., 145

OBHOLZER, A., 150

PARK, H. W., 35
PARTINGTON, M. W., 221
DE PAUW, E., 148
PEMBERTON, M., 189
PENNOCH, L. L., 30
PESSOLANO, C. J., 30
PILKINGTON, T., 226
POLLOCK, G. A., 187
PRESTON, R. L., 112
PRICE THOMAS, C., 271

Abstracts Author Index

Ralston, H. J., 31
Randall, B. F., 28, 35
Raven, R. W., 62
Romanus, R., 225
Roskam, J., 69
Rusk, H. A., 34, 67
Russek, H. I., 34
Russell, W. Ritchie, 67

Sainsbury, P., 224
Saucier, J., 109
Savage, O., 189
Schlesinger, R. A., 30
Schram, D. A., 28
Schultz, B., 267
Schwartz, D. I., 30
Schwartz, F. F., 267
Selle, W. A., 146
Shepherd, M. M., 225, 307
Silver, P. H. S., 224
Slack, H. G. B., 187
Smith, S., 224
Sperling, S. C., 149
Stammers, F. A. R., 185
Steglich, R., 35
Stoddard, A., 188
Sunderland, S., 186
Sylvester, J. D., 308

Tanberg, A., 145
Taverner, D., 306
Thompson, M., 225
Thomson, J. D., 63
Trueta, J., 185

Vaden, M. R., 267
Van Cauwenberge, H., 69
Van Zandt, I. L., 111
Verbiest, H., 223
Vliers, M., 69

Wade, O. L., 305
Wakim, K. G., 33
Walder, D. N., 64
Watkins, A. L., 31
Weiser, H. I., 191
Weiss, J., 267
Welch, R. G., 109
Winsor, T., 146
Wright, J. K., 228
de Wulf, A., 148

Yden, S., 225
Young, B. H., 151

Zinovieff, A., 151
Zohman, B. L., 34